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1 Introduction

The ***Freeway*** series range of routing switchers addresses today's need for the smaller installation whilst offering the high performance, cost effective, multi signal-format, routing offered by Pro-Bel.

This guide describes the common features of ***Freeway*** (chassis, control card, PSU, etc.). The first part of this User Guide details installation and configuration information irrespective of specific signal type. The remaining parts cover each of the specific signal types in turn.

■ 1.1 General points

Freeway routers are available in three family types, ***Freeway 32***, ***Freeway 64*** and ***Freeway 128***, each family type offers a range of configuration sizes up to a maximum defined by the family number, that is, 32x32, 64x64 or 128x128 respectively. ***Freeway*** 32 and 64 are available for all signal variants, but the ***Freeway*** 128 range is only available in audio, RS422 and timecode formats. In addition ***Freeway*** input cards, providing 16 channel input modules, may be used with any of the video and audio routers in the Freeway 32, 64 or 128 ranges. I n using these input modules with the standard signal cards, each range can be configured to provide routers from 16x16 to the maximum permitted size for each range in either 16input or 16 input/ output blocks.

By designing each signal-type module to require identical PSU and support functions, any combination of signal types may be housed in the same chassis. So that, for instance, a 32x32 SDV and stereo audio switcher can be housed within the same frame.

Two frame variants are available for the Freeway range, one 3U; accommodating a total of 4 signal cards, while the 6U variant houses up to 8. Typically, Freeway 32 and 64 routers along with the Freeway 128 RS422 and timecode systems use the 3U, whilst Freeway 128 audio routers use the 6U frame. However, as these frames can accommodate any modules in the Freeway range, smaller audio routers may be housed in the 3U frame while Freeway 32 and 64 cards can share a 6U frame with Freeway 128 modules.

Freeway's modularity ensures that your switcher can change as your requirements do, permitting routers to be ‘plug and play’ upgraded in the field to their maximum size. Similarly a predominantly analogue router can gradually be ‘transformed’ into a digital router (by swapping analogue sixteen square modules for digital alternatives) as your installation requirements evolve. In Chapter 3 we'll tell you how to get your

router 'up and running' and, in Chapter 4, how to configure the system for your present needs and future expansion.

■ 1.2 Control

Control for the router is provided by an internal daughter card. Optionally a second control card can be fitted thereby providing a back-up controller should the primary card fail. ***Freeway's*** control system offers extensive facilities, supporting up to 32 panels or under monitor displays. Panel types may be XY, button-per-crosspoint or multibus. Internal database editing functions provide extensive system configuration options including; programmable salvos, source and destination associations, marrying, route protects and inhibits, audio channel configurations and overrides. Up to 8 levels of ***Freeway*** routing may be slaved to the main frame by means of a parallel control link. A special version of this parallel link is also available to slave existing TM Series routers. Extensive details of the ***Freeway*** control system (and how to edit the internal database information) are given in Chapters 4, 5 and 6.

■ 1.3 Environmental

By utilising advanced PSU circuit topology and the latest signal switching technologies, ***Freeway*** offers a very compact router with low power dissipation, ensuring 'fit and forget' reliability. For extra security, each frame has provision for redundant PSU modules, providing a main and backup architecture in the event of a PSU failure. The high-speed converter technology in the PSU is monitored by two on-board microprocessors that assess the condition of the mains and of the supplies leaving the power unit. Should any of the PSUs 'vital-signs' show a warning condition these are monitored and, if appropriate, an external warning alarm may be activated. ***Freeway*** PSUs may be withdrawn from the unit from the front and a replacement 'hot-plugged'; thereby ensuring continuous service. For details, see Chapter 3.

■ 1.4 Problems?

We hope you won't have them! Perhaps it's 'finger-trouble'… or something more serious? In Chapter 14 you'll find a problem solving guide to help you with possible questions. You'll also find contact information for our Customer Service department in Chapter 2.

Note: This product contains no user servicable parts; should this product require servicing please refer to Pro-Bel or your local agent.

1.5 The right choice

Choosing a switcher is an important decision, no-one wants to get it wrong. With all the changes in television production today, you need a router that can evolve and change. That's why we developed ***Freeway***, the future-proofed modular multi-format routing system that provides you with the smoothest ride to the future.

We're glad you agree with us.

The Freeway Team

2 Installation

Any Pro-Bel equipment may be mounted next to other equipment provided it is not subjected to excessive heat from that equipment. In order to maintain a cool, internal temperature, make sure that the fans (if fitted) and vents on either side of the equipment are unobstructed. Proper air circulation requires that both the fans and vents have access to the ambient temperature room air mass.

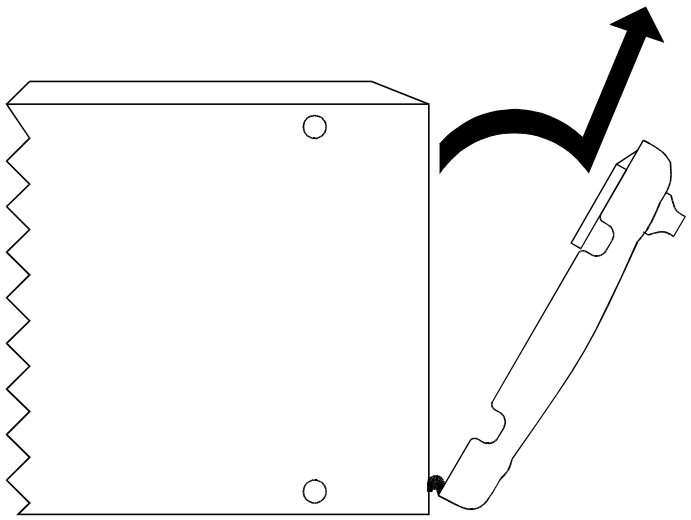
During the installation process it is important to observe the following points:

- do not obstruct the vents on the unit to allow cooling to take place
- remove shipping brackets

■ 2.1 Door removal

The frame has a horizontally hinged front panel door that can be opened by turning the knob anti-clockwise. The door can be removed from the frame by opening it approximately 30° and lifting upwards. It will not disconnect from the hinge at a greater angle.

For correct re-fitting of the door, ensure that it is centrally located on the hinge.



■ 2.2 Power supply removal

There are two power supply modules used for main and backup. For EMC and safety reasons the mains, chassis and signal earths are permanently connected together with the module.

A green LED on each PSU indicates the status of the power supply. PSU relay alarms are also fitted.

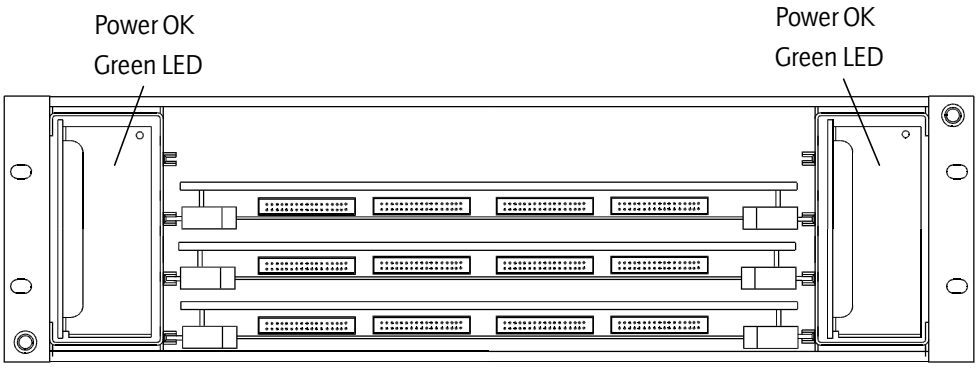
The power supply modules are push fit into the frame and each secured by two screws on the rear of the frame.

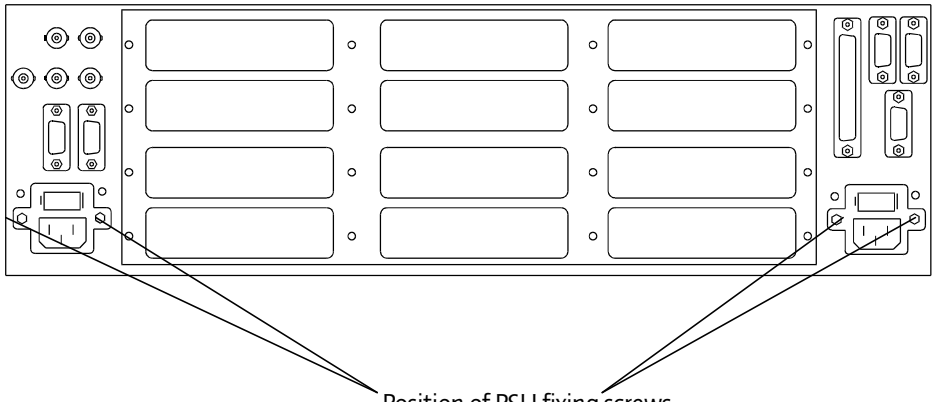
When replacing the power supply the following recommendations ***must*** be observed:

- always disconnect the mains from the unit before removal or during repair
- the securing screws should always be fitted before connecting the mains to provide essential chassis earthing

*Note: The **Freeway** PSU automatically adapts to the voltage range supplied. There is no need to set a mains voltage selector position.*

WARNING: **The screws form an essential chassis connection for EMC compliance and must not be omitted**




Position of PSU fixing screws
on rear of panel

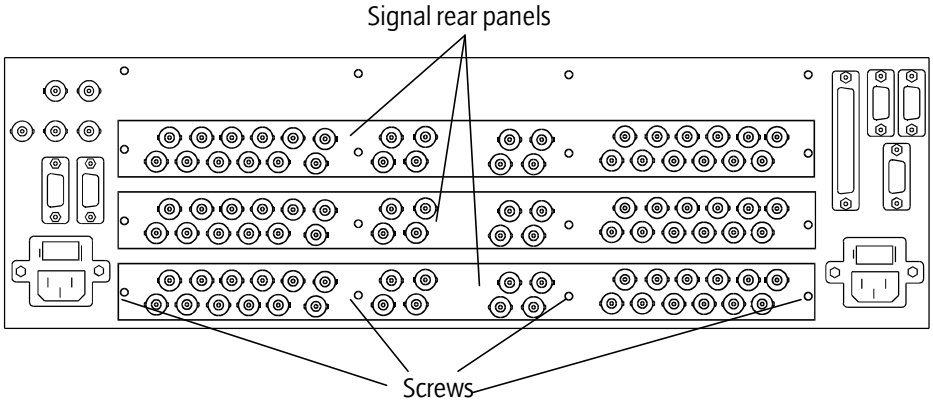
■ 2.3 Signal rear panel removal

Connections to the outside world are made through panels on the rear of the frame. The control rear panel is common throughout the ***Freeway*** range and is fixed.

The signal rear panels are easily removed in the following manner:

- disconnect power from the frame
- remove the screws
- gently pull panel out
- replace panel and screws ensuring a good fit is made for EMC compliance

The connection details for the rear panels supplied are described in the appropriate section of this User Guide.



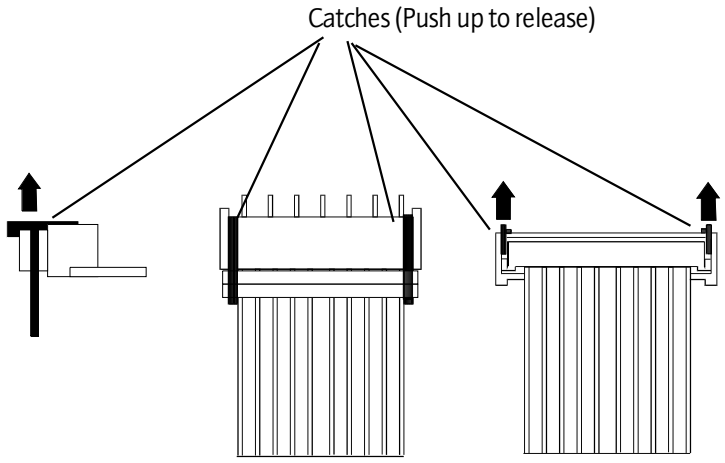
■ 2.4 Removal and replacement of modules

The modules can be removed and replaced from the frame, powered or un-powered, using the following procedure. For removal purposes it is advisable to remove the ribbon cables first and then the cards.

- release the ribbon cables by pushing the catches up on either end of the connector as shown
- lift up the card ejector on the module and gently pull the card out

Replacement is the reverse of above:

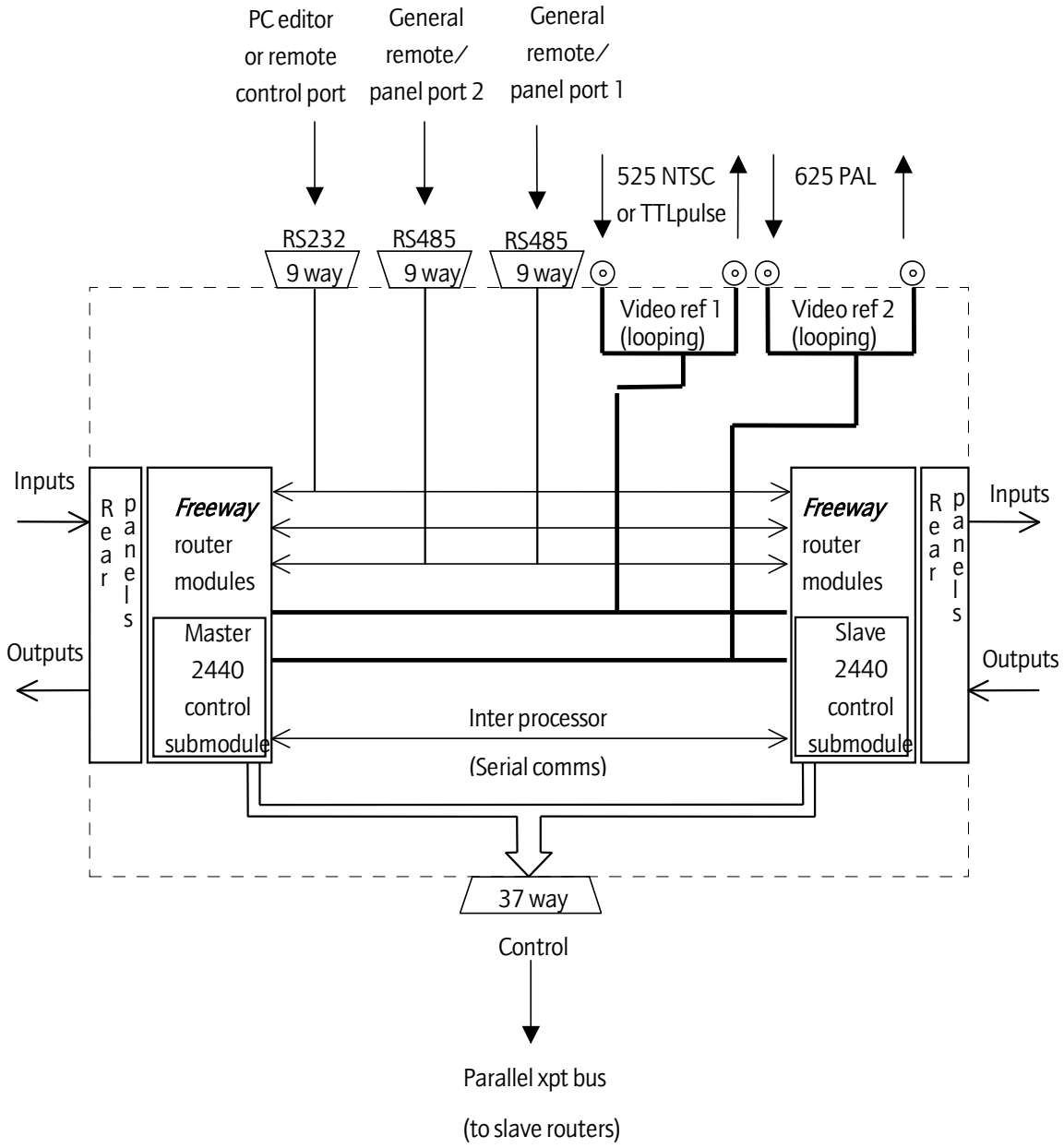
- slide the card along the guide rail of the required slot, gently pushing it fully home until it marries up with the connector on the motherboard
- if a card has a board reset button (eg 4744 card), this should be pressed after the board has been plugged in



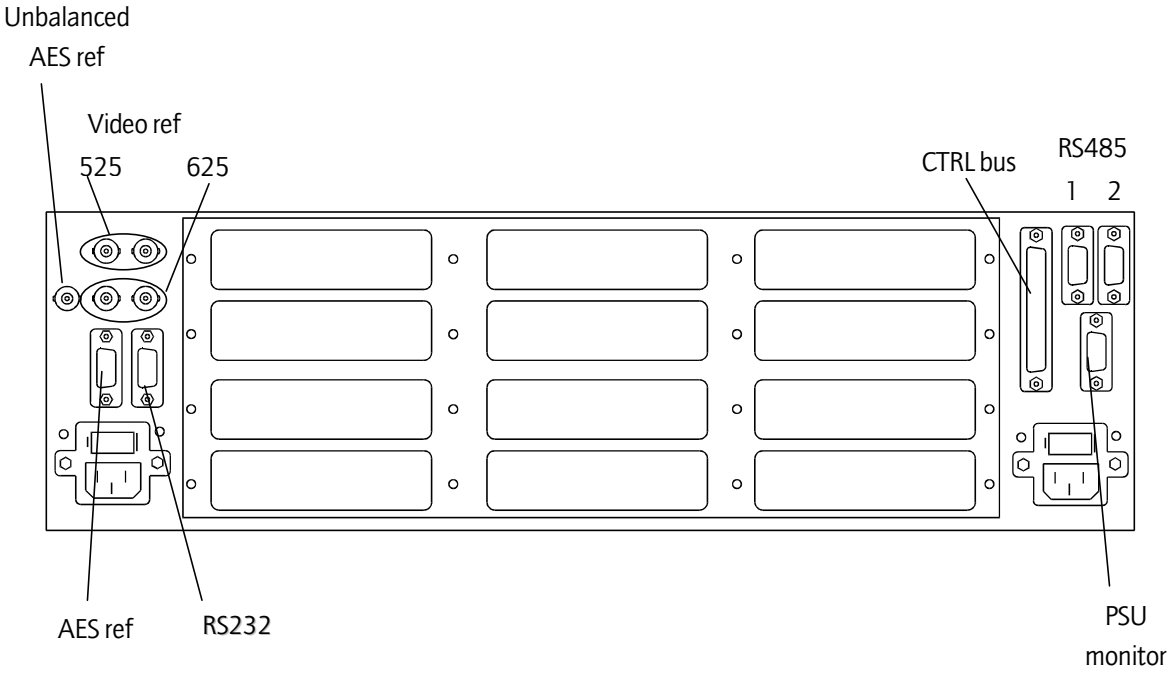
■ 2.5 Cable connections

The standard cable connections diagram for a ***Freeway*** router is shown below.

Note: The ***Freeway*** router can be controlled from multidropped panels (i.e. a chain of panels on a common pin-to-pin cable bus, each set to a different address) on ports RS485-1 and RS485-2 or from control systems on point to point links.

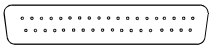


The following diagrams show the position of these connectors on the rear of both the 3U and 6U ***Freeway*** frames.



■ 2.6 Control rear panel connections

'CONTROL' connector pinout

37 way 'D' type fixed socket on frame 

Pin	Function	Pin	Function
1	ENABLE	20	H/SHAKE
2	LEVEL A3	21	LEVEL A2
3	LEVEL A1	22	LEVEL A0
4	DEST A6	23	DEST A5
5	DEST A4	24	DEST A3
6	DEST A2	25	DEST A1
7	DEST A0	26	A6 SOURCE
8	A5 SOURCE	27	A4 SOURCE
9	A3 SOURCE	28	A2 SOURCE
10	A1 SOURCE	29	A0 SOURCE
11	AUDO	30	AUD1
12	AUD2	31	F/SYNC
13	STROBE	32	N/C
14	N/C	33	N/C
15	N/C	34	N/C
16	N/C	35	N/C
17	N/C	36	N/C
18	N/C	37	CHASSIS
19	CHASSIS		

'RS485-1' and 'RS485-2' connector pinouts

9 way 'D' type fixed sockets on frame. 

Pin	Pinout of socket when connected to:	
	Panels	Control system
1	CHASSIS	CHASSIS
2	Rx-	Tx-
3	Tx+	Rx+
4	0V	0V
5	n/c	n/c
6	0V	0V
7	Rx+	Tx+
8	Tx-	Rx-
9	CHASSIS	CHASSIS

'RS232' and 'EDITOR' connector pinouts

9 way 'D' type fixed sockets on frame. 

Pin	Function
1	N/C
2	Rx
3	Tx
4	N/C
5	0V
6	DTR COMMON
7	RTS
8	CTS
9	N/C

'PSU' monitor pinouts

9 way 'D' type fixed socket on frame. 

Pin	Function
1	CHASSIS
2	PSU 1 RELAY COM
3	PSU 1 RELAY S/C FAIL
4	PSU 1 RELAY O/C FAIL
5	PSU 2 RELAY COM
6	PSU RELAY S/C FAIL
7	PSU RELAY O/C FAIL
8	N/C
9	N/C

S/C - Closed in fail condition

O/C - Open in fail condition

■ 2.7 Video references - BNC sockets (looping)

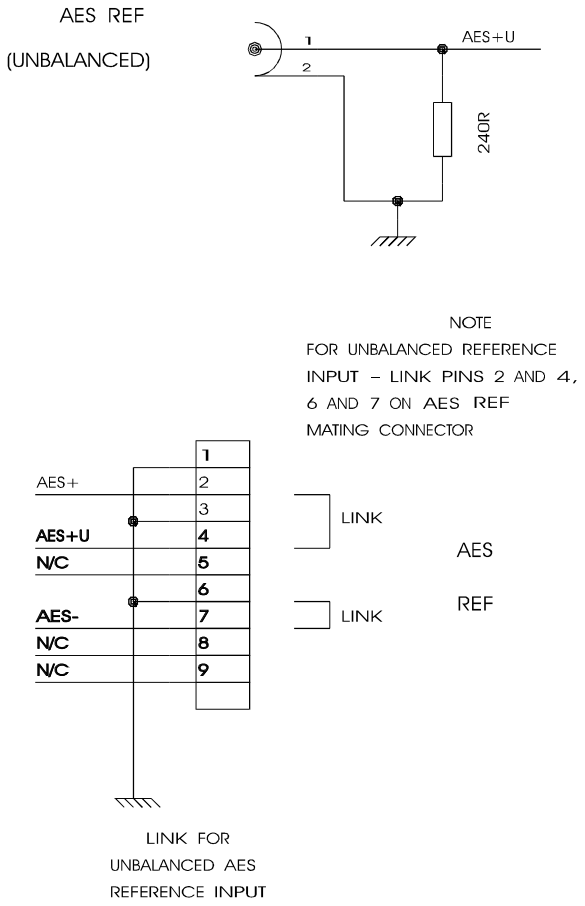
Freeway can handle video signals of either 525/60 standard or 625/50 standard (analogue or digital). Some users wish to route both types of signal simultaneously. Most routers only provide for a single video 'house reference' and this presents a problem because a PAL reference cannot be used to ensure vertical ('flash-less') switching of a 525/60 signal. The converse is also true. ***Freeway*** delivers maximum flexibility by providing inputs for both PAL and NTSC 'house reference' signals. Ideally colour-black, the ref signal may also be any stable video signal. Users may assign which inputs are 525/60, and which are 625/50 via the configuration editor (described later in this manual).

■ 2.8 Setting the AES reference

In order to perform 'click-less' switching of digital audio signals, a 'cut' must be made during a point in the data stream when no audio is present (usually during a pre-amble). For this to happen, the switcher must receive a digital audio reference signal synchronous with the audio signals arriving at the frame.

Note that an audio cut is performed at the first appropriate instant following a television field boundary (as derived from the video reference input).

The ***Freeway*** router can be configured to accept an unbalanced digital audio reference, via the unbalanced AES reference BNC. In this case a 'dummy' 9 way 'D' type connector and shell, containing two wire links, must be fitted to the AES reference input connector. The diagram below illustrates the necessary installation details.



2.9 Setting the level switch

For separate routers to be controlled independently, each must have a different level address set. This operation is achieved by means of the DIL switch marked Level Decode on the front of each ***Freeway*** card.

The levels are set as follows, where 0 is UP and 1 is DOWN:

Level Decode Switch

SW 1	SW 2	SW 3	SW 4	Level No
0	0	0	0	1
1	0	0	0	2
0	1	0	0	3
1	1	0	0	4
0	0	1	0	5
1	0	1	0	6
0	1	1	0	7
1	1	1	0	8

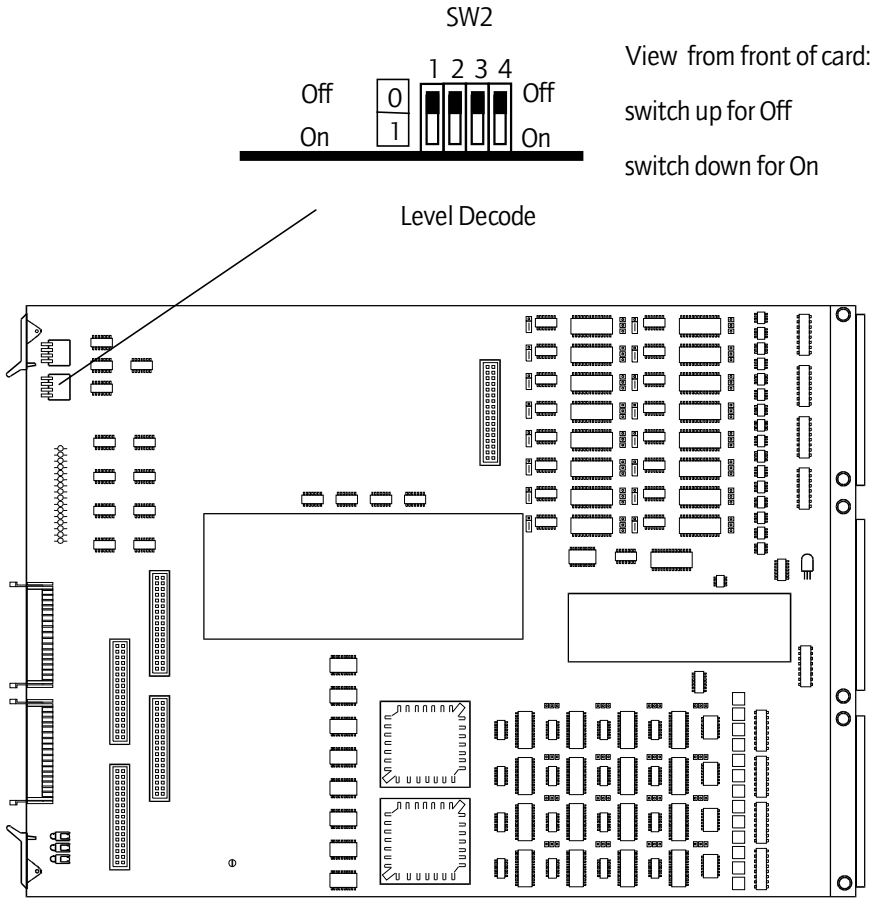
The maximum total number of independent levels is 8. A typical system might be arranged like this:

Level 1 Serial Digital Video

Level 2 Analogue Video

Level 3 AES Digital Audio

Level 4 Stereo Analogue Audio


SW2
1 2 3 4
Off
On
0
1
Off
On
View from front of card:
switch up for Off
switch down for On
Level Decode

■ 2.10 Setting the destination assign switch

What's the purpose of the switch marked 'HIGHER DEST DECODE'? Well, because we make all ***Freeway*** modules the same, in a router bigger than 16x16, you have to 'tell' each card what range of sources and destinations it's assigned to. That's the purpose of this switch. The range is assigned as follows, where 0 is UP and 1 is DOWN:

Higher Dest Decode Switch

SW 1	SW 2	SW 3	SW 4	Source and destination Range
0	0	x	x	1-16
1	0	x	x	17-32
0	1	x	x	33-48
1	1	x	x	49-64

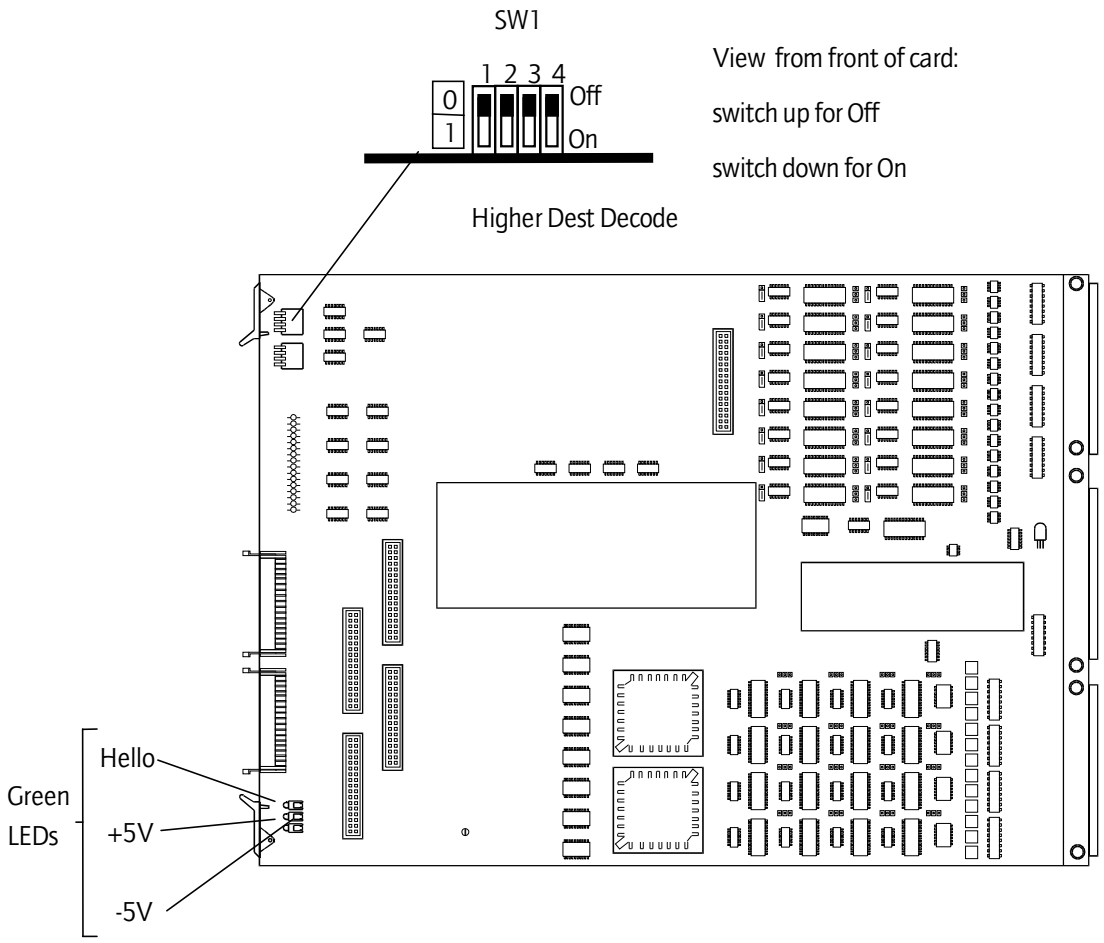
■ 2.11 LED indications

Two of the three LEDs simply indicate that power is arriving at the board. ***Freeway*** routers all operate from two rails only (where others are needed these are generated on the ***Freeway*** cards themselves). The two rails are +5V and -5V.

The third LED is labelled 'HELLO'. This is useful in determining if the control system has spoken to a particular board and, specifically, to tell you if you set the 'level' and 'higher dest decode' switches correctly.

When the control system sends a command (say in response to a button push), the appropriate part of the router responds, depending on how the board configuration switches are set.

If a board receives a command on which it should act, it 'winks' the 'HELLO' LED. Meaning, *'Hello, I've just received a command that's relevant according to my programmed place in the scheme of things.'*


SW1
1 2 3 4
0
1
Off
On
View from front of card:
switch up for Off
switch down for On
Higher Dest Decode
Green
LEDs
Hello
+5V
-5V

■ 2.12 *Freeway* control card

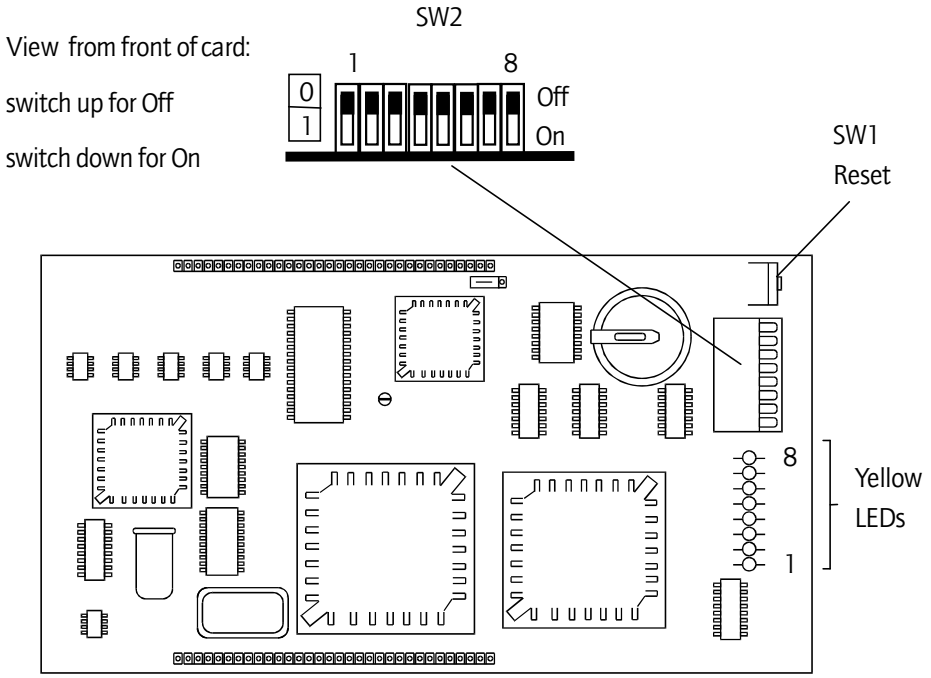
Central to the operation of the ***Freeway*** router is the control card.

The ***Freeway*** control card is used to control and configure the router (optionally two cards may be fitted to provide backup in the event that one microprocessor card should fail).

Setting the DIL switch

The purpose of (and default positions) of each of the switches is given below. A description of each of the diagnostic LEDs (see configuration section) is given in the diagram opposite.

Switch SW2	Function	Selection		Default
		UP	DOWN	
1	MASTER/SLAVE SELECT	SLAVE	MASTER	DOWN
2	µP CLOCK SELECT	10 MHz	20 MHz	DOWN
3	SYSTEM RUN MODE	NORMAL	TEST	UP
4	RS232 PORT SELECT	EDITOR	REMOTE	DOWN
5	DEFAULT TRIGGER SELECT	625	525	UP
6	RE-CONFIGURE	MANUAL	AUTO	UP
7	DATABASE TYPE	FIXED	CONFIGURE	UP
8	CONTROL MODE	GENERAL	PANELS	UP



LED	Function
8	REF2 PRESENT
7	REF1 PRESENT
6	ERROR
5	FLASH FOR XPNT SELECT
4	IDLE/ACTIVE
3	ACTIVE FLAG
2	RESET
1	POWER

2.13 Setting the reset switch

There are physically two RESET switches available to perform a hard reset of the Freeway controller. One is located on the edge of the 2440 sub-module and the other is remotely located on the front edge of the Main Card on which the 2440 is sited. Pressing either has the same effect.

Initiating a hard reset is akin to powering down and powering up the controller. The controller re-boots and follows the usual power-up sequence. It should be noted that the panels will shut down and then be restored after initialisation has completed. It should also be noted that resetting the active controller in a dual control environment will cause system changeover.

If no changes have been made to the database then no crosspoints will be changed.

However, crosspoint settings may change if the level type for a level was changed prior to the reset as during initialisation the crosspoints are set according to the level type for that level.

3 Hardware configuration

The following sections define the hardware configuration for the ***Freeway*** 32, 64 and 128 router ranges.

■ 3.1 Router details

Video and audio router configurations

The size of ***Freeway*** 32 is limited to:

- 32 sources
- 32 destinations

using 2 crosspoint modules with 16 input buffers, 16 output buffers and 32x16 crosspoints.

The size of ***Freeway*** 64 is limited to:

- 64 sources
- 64 destinations

using 4 crosspoint modules with 16 input buffers, 16 output buffers and 64x16 crosspoints (128x16 crosspoints for audio).

The size of a ***Freeway*** 128 audio router is limited to:

- 128 sources
- 128 destinations

using 8 crosspoint modules with 16 input buffers, 16 output buffers and 128x16 crosspoints.

The 3U ***Freeway*** frame can house up to 4 plug in modules of the required combination, while the 6U frame can house up to 8 plug in modules of the required combination.

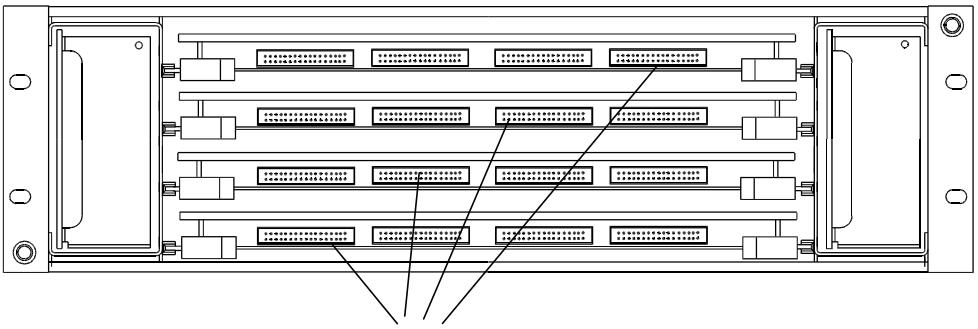
Freeway frames can hold mixed signal types in any combination of crosspoints.

However, due to the exceptional density of the router, space restrictions on the rear panel mean that mixed format routers, with different signal types in adjacent slots, must be installed as shown below:

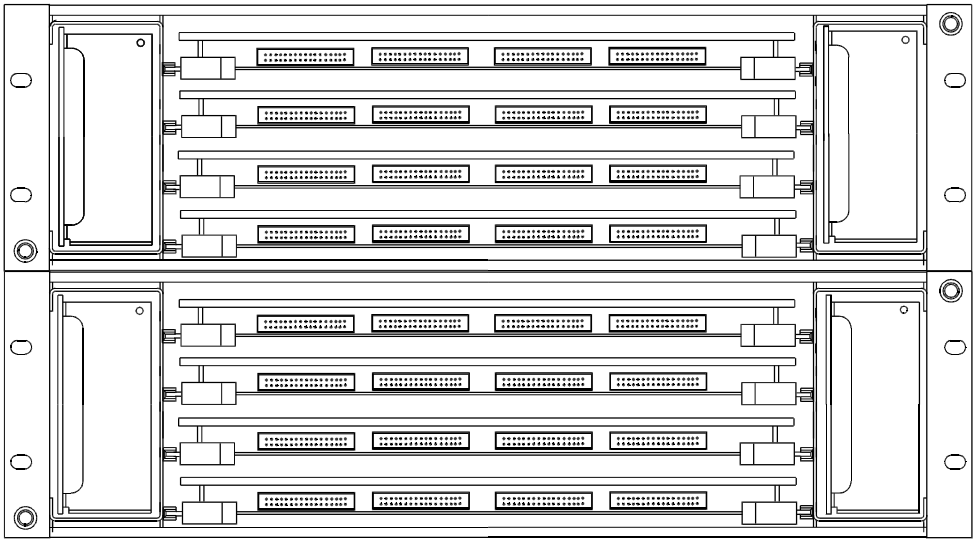
Audio must be installed above video

AES must be installed above analogue audio

Whilst this is done where necessary on mixed format frames shipped from the factory, if you have a partially equipped frame which you intend to expand in the future, bearing this in mind now will save moving rear panels and re-cabling in the future.



Router modules



Supplementing the ***Freeway*** 32, 64 and 128 video and audio ranges, Freeway input cards providing 16 input channels only may be used to construct 'non-square' configurations as follows;

Freeway 32

	Required Modules	
Router Size	Crosspoint modules	Input buffer modules
16x16	1	0
32x16	1	1
32x32	2	0

Freeway 64

	Required Modules	
Router Size	Crosspoint modules	Input buffer modules
16x16	1	0
32x16	1	1
48x16	1	2
64x16	1	3
32x32	2	0
48x32	2	1
64x32	2	2
48x48	3	0
64x48	3	1
64x64	4	0

Freeway 128

	Required Modules	
Router size	Crosspoint modules	Input buffer modules
80x80	5	0
96x80	5	1
112x80	5	2
128x80	5	3
128x96	6	2
128x112	7	1
128x128	8	0

Note that not all possible configurations have been shown for the Freeway 128 audio router range.

RS422 and timecode router configurations

The size of a ***Freeway*** 128 timecode router is limited to:

- 128 sources
- 128 destinations

using 4 crosspoint modules with 32 input buffers, 32 output buffers and 128x32 crosspoints, within a 3U frame.

The size of a ***Freeway*** 128 RS422 router is limited to:

- 128 ports

using 4 crosspoint modules with 32 ports and 128x32 crosspoints, where each port is user configurable as a device or controller. The 128 port router can be constructed within a 3U frame

■ 3.2 Port definitions

Freeway has 4 ports available. The ports are defined below:

- 2 x RS485 General Remote ports
- 1 x RS232 Editor or RS232 General Remote port 3.
- 1 x Serial Inter Processor Comms (IPC) port

The IPC port is an internal link and has no external access.

The RS232 port is switch selectable to be either an Editor port (used to configure the system) or a General Remote port.

Each of the General Remote ports can be configured to support one of a number of protocols from the following list:

- SW-P-02 General Switcher Protocol †
- SW-P-06 Multi-drop Communications Protocol*
- SW-P-08 General Remote Control Protocol †

* General Remote port 3 (RS232) does not support multi-drop Communications protocol.

† These protocols are described in the next section.

Port characteristics

The characteristics for each port are defined in the table below:

Port Name	Standard	Protocol	Baud rate	Data bits	Parity	Stop bits
Gen Remote 1	RS485	Configurable				
Gen Remote 2	RS485	See Chapter 9				
Editor/Config	RS232	SW-P-08	38400	8	N	1

Pro-Bel General Switcher Protocol (SW-P-02)

Pro-Bel General Switcher Communication Protocol is a robust, asynchronous method of controlling routing switchers. It is the preferred method of controlling Pro-Bel routers.

The normal electrical parameters of the interface are:

- RS485
- 8 bit data
- 1 stop bit
- EVEN parity
- 38.4K baud

Although the interface can be set to operate with any common RS485 and RS232 parameters.

The message format protocol is standard, and always conforms to the following format:

SOM	COMMAND	MESSAGE	CHECKSUM

Where:

SOM	=	Start of message	=	FF Hex
COMMAND	=	Command byte, which also defines message length		
MESSAGE	=	May be zero or more bytes		
CHECKSUM	=	7 bit, 2s compliment sum of command and message field (msb=0)		

Pro-Bel General Remote Control Protocol (SW-P-08)

This protocol has been developed to provide a common and robust method of interfacing Pro-Bel control systems to a variety of standard and custom applications. It is the standard protocol for interfacing a controller to a remote device.

■ 3.3 Controller configuration

The controller has provision for configuration. There exists an editor port, and an 8-way switch to support a configurable system.

Editor port

This is an RS232 port connected to a PC based editor.

Configurable switches

The function of each of the switches located on the 2440 are defined in the table below.

Switch SW 2	Function	Selection		Default
		UP	DOWN	
1	MASTER/SLAVE SELECT	SLAVE	MASTER	DOWN
2	μP CLOCK SELECT	10 MHz	20 MHz	DOWN
3	SYSTEM RUN MODE	NORMAL	TEST	UP
4	RS232 PORT SELECT	EDITOR	REMOTE	DOWN
5	DEFAULT TRIGGER SELECT	625	525	UP
6	RE-CONFIGURE	MANUAL	AUTO	UP
7	DATABASE TYPE	FIXED	CONFIGURE	UP
8	CONTROL MODE	GENERAL	PANELS	UP

A description of the function of each of the switches is given below:

sw2_1 Master/Slave select is used, in dual control situations, to assign Master/Slave status to the 2440 control cards. One card would be set to MASTER and the other to SLAVE so that on reset or power up the Master 2440 powers up first and, hence, always becomes the active controller.

Sw2_2 μP clock select is used to select between 10 MHz and 20MHz uP clock frequency.

Sw2_3 System Run Mode determines which mode of operation the ***Freeway*** powers up in (i.e. NORMAL or TEST). NORMAL is the standard mode of operation. TEST selects a special test mode where various features of the 2440 hardware can be tested as a result of invocation via the editor terminal.

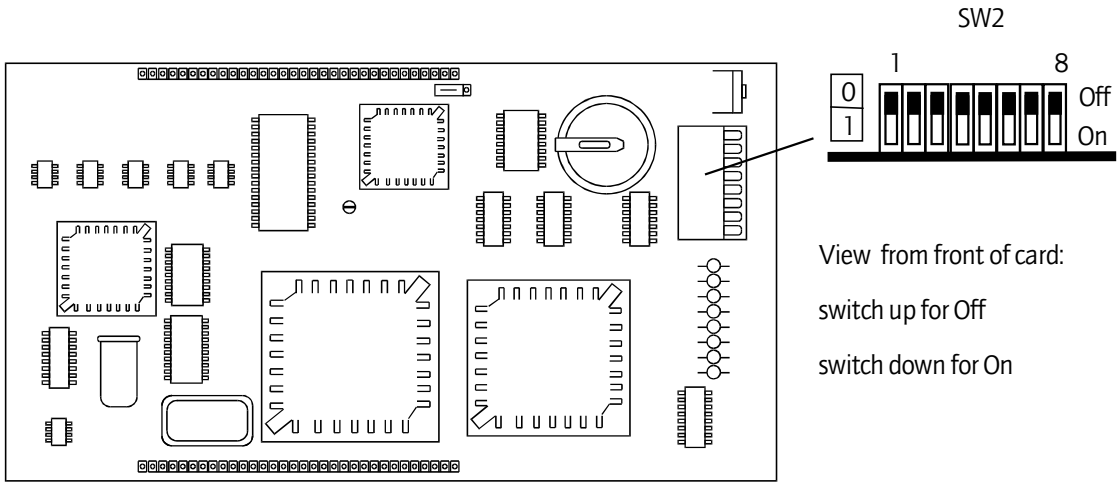
Sw2_4 RS232 port select determines the function of the RS232 port. EDITOR configures the RS232 port to be an editor port. REMOTE configures the port to be a General Remote port. For systems using the Windows editor, this switch should always be set for REMOTE operation.

Sw2_5 Default trigger select is used to select between 625 or 525 reference to be assigned to each source for the fixed databases.

Sw2_6 Reconfigure selects between AUTOmatic reconfigure of cards in the system on power-up or reset and MANUAL reconfigure where a reconfigure only occurs if manually invoked via the terminal editor. For systems using the Windows editor, It is recommended that this switch is set to AUTO.

Sw2_7 Database Type selects whether to use the fixed, non-editable database or the editable one.

Sw2_8 Control mode is used in conjunction with sw2_7 to select which fixed database to use. GENERAL database configures both RS485 Remote ports to support SW-P-02 General Switcher protocol. PANELS database configures both RS485 Remote ports to support Multi-drop Comms protocol.



Diagnostic LEDS

The 8 diagnostic LEDS (Yellow) are employed as defined in the table below.

LED	Function
1	POWER ON
2	RESET
3	CONTROL CARD ACTIVE
4	Flashing at 2Hz - ACTIVE CONTROLLER Flashing at 1Hz - IDLE CONTROLLER
5	CROSSPOINT SET - FLASHES WHEN SET
6	NO HANDSHAKE FROM A MODULE
7	REF 1 INPUT DETECTED
8	REF 2 INPUT DETECTED
4,8	4 on & 8 flashing: R/W error with RAM
4,7	4 on & 7 flashing: Checksum error in EPROM

■ 3.4 Software controllable processes

This section lists the software controllable processes present on the 2440 control card:

- selecting trigger method to switch, i.e. 525/625/TTL pulse/crash
- active/Idle Changeover control
- setting crosspoints and audio features such as summation and channel swap
- reading switcher card handshakes

RAM/EPROM

The RAM/EPROM available is defined in the table below.

Media	Size (bytes)	Comments
RAM	512K	
FLASH	512K	Program area

FLASH EPROM

The FLASH EPROM is partitioned into 3 sectors:

- boot sector contains boot-up and special test mode programs. Main program and OEM protocol files, in Motorola 'S-record' HEX format, can be downloaded from disk. The code is transferred to the relevant sector in the FLASH EPROM
- main program sector contains the Normal Run code

4 Control system operation

The following sections describe the control system of ***Freeway***. The control module provides the interfaces, database and software to configure and control the ***Freeway*** series routers.

■ 4.1 Master and slave module details

The ***Freeway*** unit containing the plug-in control modules is designated MASTER and all other units are designated SLAVES as they are slaved off the master using a unidirectional parallel bus. Each of the main router units has level address select switches that are used to identify each of the control levels.

Each router provides a module detect (handshake) mechanism so that the system control module can detect the presence of various router units.

■ 4.2 Master router dual control and changeover

In a dual-control environment, one card is 'ACTIVE' while the other is 'IDLE'. In the event of the 'ACTIVE' controller failing, the 'IDLE' controller will take over control of the frame and become 'ACTIVE'.

On power up, the controller designated MASTER will also become 'ACTIVE'. Every main loop, the software checks whether a changeover has occurred. When a controller changes state from 'IDLE' to 'ACTIVE', or on power-up, a message is issued to General Remote ports to report this fact. Thereby this information may be relayed to an external control system such as a Pro-Bel System 3 controller. An Editor's version message will also be displayed on the editor terminal.

Both controllers contain identical data concerning the state of the system. This is maintained by incorporating a serial link between them. Tally information is requested on a background basis by the idle card.

Arbitration ensures only the active card sets crosspoints.

If a second card containing a control module is plugged into a frame containing an active controller, the database is automatically downloaded to the new (idle) controller.

Do not press the reset on the card containing the ACTIVE controller after plugging in the IDLE controller. It takes several minutes to download the database. If the reset is pressed during this time ALL DATABASE SETTINGS WILL BE LOST, and the default database loaded.

■ 4.3 Operating modes

The ***Freeway*** master router has two basic modes of operation selected by sw2_3.

- Normal Run mode
- Special Test mode

Normal run mode

In Normal mode, the way in which the control card operates is dependant on the protocol defined for each of the general remote ports.

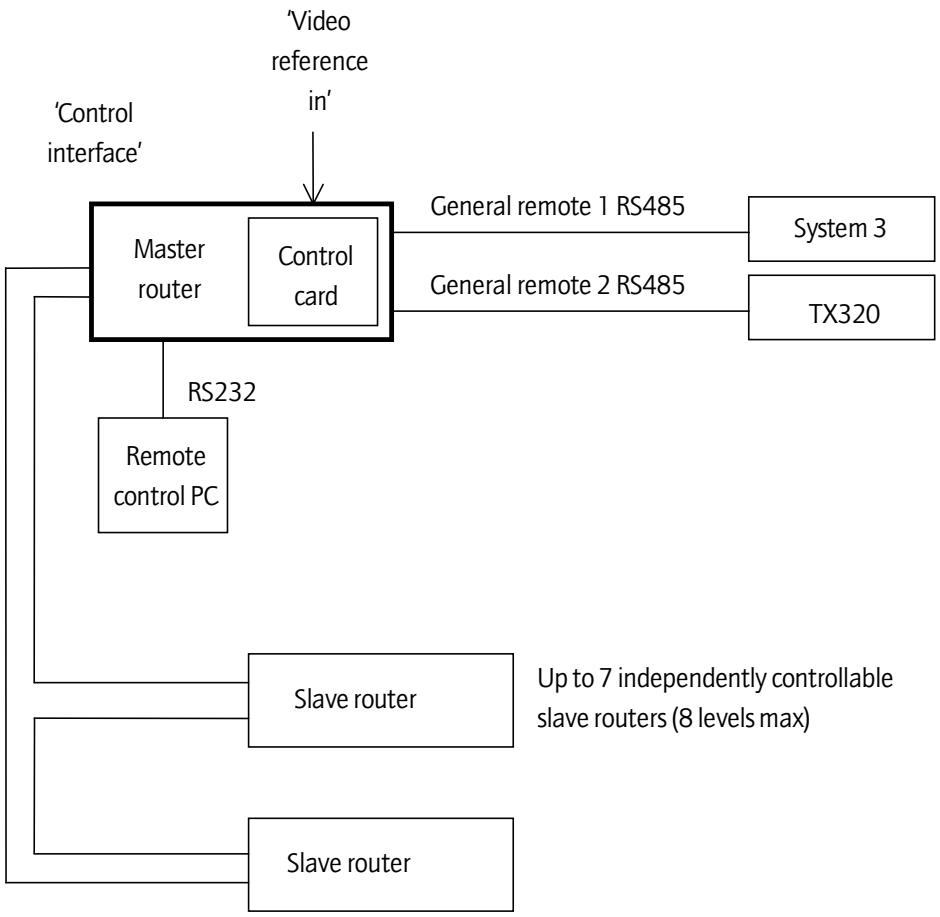
For instance, if one of the General Remote ports is configured to support *multi-drop comms protocol* then, from this port's point of view, the controller is acting as a basic system controller.

If, on the other hand, one of the general remote ports is configured to support General Switcher Protocol then, from this ports point of view, the control card is acting as a local controller for a router. It will be controlled by a more intelligent control system. The remainder of this chapter considers normal operation in detail. But first a description of the Special Test mode.

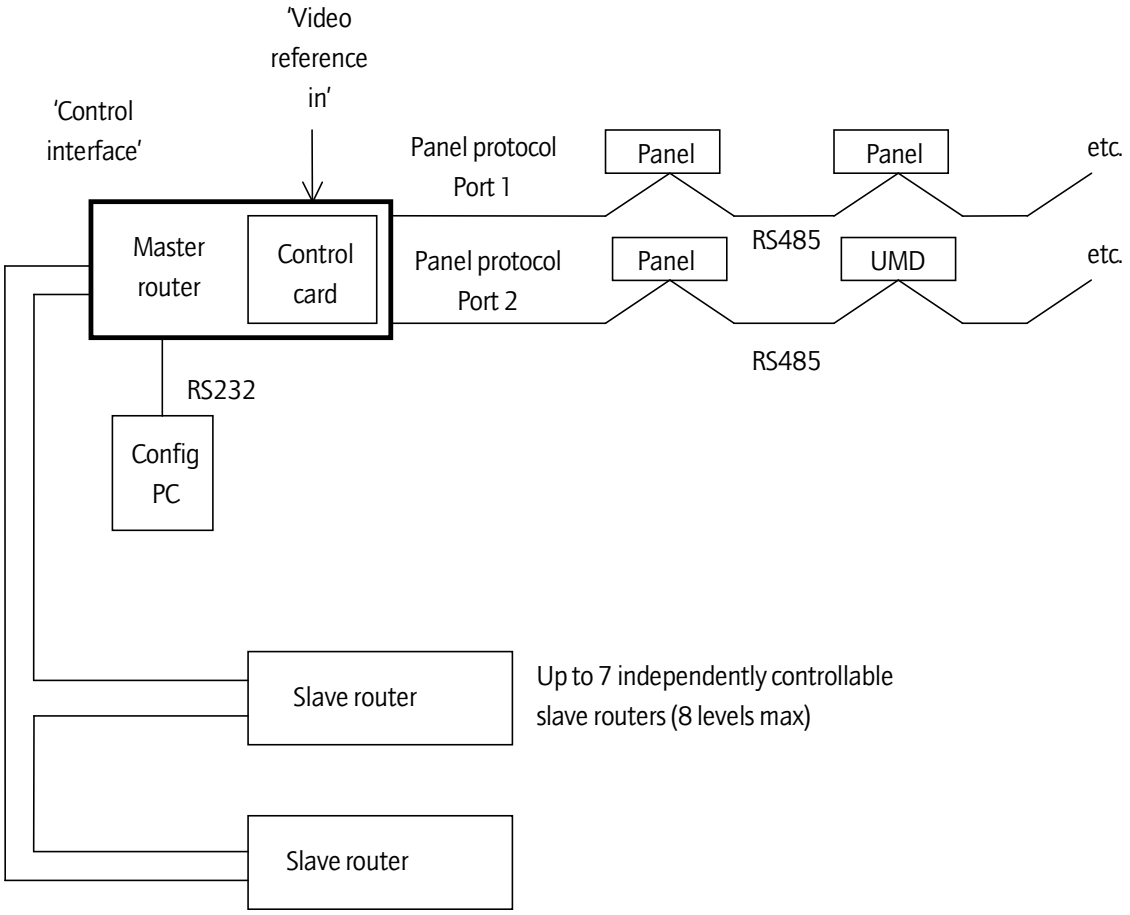
Freeway block diagrams

The two following block diagrams illustrate typical set-ups for ***Freeway***. The way in which the system operates is wholly dependant on the configuration of the general remote ports. The first diagram shows Freeway behaving as a router, being controlled by an external control system. The second illustrates Freeway configured as a basic system controller, where two of the General Remote ports are configured as multi-drop panel ports and the RS232 port selected to be the Editor/configure port.

Freeway operating as an externally controlled router



Freeway operating as a basic system controller



Special test mode

WARNING: **It is only appropriate that this mode is selected by suitably qualified service and maintenance staff.**

Special test mode provides a number of tests for various components of the 2440 hardware, e.g. RAM/EPROM, serial ports, LEDS and router control bus. The tests are initiated via the editor port (see 'Terminal command set' for command syntax). This section describes each of the tests requiring invocation via the Editors as well as those running cyclically.

RAM/EPROM tests

This test performs a read/write RAM test and an EPROM checksum test. Results are reported to the terminal. This test can be performed with the controller sited in a ***Freeway*** frame.

Loop back test RS485 General Remote port 1

This test requires the Rx lines to be connected to the Tx lines. This test is a two phase test, in both phases a comparison between the transmitted and received data is made and the results reported to the terminal. This test can be performed with the controller sited in a ***Freeway*** frame.

Loop back test RS485 General Remote port 2

This is an identical test to that performed on General Remote port 1 but operates on Remote Port 2. This test can be performed with the controller sited in a ***Freeway*** frame.

Loop back test inter processor comms port

This is an identical test to that performed on General Remote port 1 but tests logic in an internal PAL device. This test can only be performed at Pro-Bel factory.

Reference tests

This test verifies that the Reference inputs cause change of state interrupts on the QUART. A reference present/absent status result is reported to the terminal for each reference. This test can be performed with the controller sited in a ***Freeway*** frame.

Switch position test

This test reports the current settings of the configurable switches to the terminal. This test can be performed with the controller sited in a ***Freeway*** frame.

Diagnostic LED test

This is a continuous, visual, cyclic LED test of the diagnostic LEDS, turning each one on in turn. This test can be performed with the controller sited in a ***Freeway*** frame.

5 Routing

This section describes the mechanisms for setting crosspoints and reading handshakes.

■ 5.1 Setting crosspoints

Individual crosspoints are set via a parallel bus which issues from the 2440 card and is accessible to all cards fitted in the ***Freeway*** frame. The order of events is as follows:-

1. The SYNCS signal leaving the 2440 card is disabled
2. Level, Destination and Audio bits (if applicable) are written to the parallel bus
3. The Source bits are written to the parallel bus
4. The source and dest data is strobed into first-stage latches
5. SYNCS are resumed

This ability to disable SYNCS is particularly useful for salvo switching, as multiple routes can be set up while the SYNCS are disabled and then set all at once when SYNCS are re-enabled and a SYNC pulse occurs; or when forced to crash switch.

The switching position is fixed in hardware and conforms to SMPTE RP-178 specification.

The AES level has a dedicated AES reference generator that determines the appropriate instant to switch noiselessly between audio sources. It is only enabled when a crosspoint trigger pulse occurs on the F/SYNC line. In other words, the audio switches at the first appropriate point during a field interval.

■ 5.2 Salvo switching

Salvos are groups of crosspoints that are set up and then taken altogether in one go.

There are two distinct processes associated with salvos in ***Freeway***:

- salvos set from an external control system.
- salvos configured via Editors and then set via control panels.

In the first case an external system controller would be connected to one of the ***Freeway*** General Remote ports communicating Pro-Bel General Switcher protocol. It has the ability to set up and take salvos on the ***Freeway***. Crosspoints within a salvo are stored and only taken on receipt of a 'GO' command from the system controller. Before setting the actual crosspoints the route inhibit table is first checked if the 'check route inhibit table' flag is set for the port.

In the second case, salvos can be configured from the Editor and taken using the control panels or the Editor. The salvos are stored as part of the database - the default being no salvos configured. Salvos can be dialled up and taken like a source association from the control panels. In this type of salvo, the sources may be configured to switch using different trigger methods. The software will set batches of crosspoints related to the trigger method configured. The order of events is given below:

- set up crosspoints to be Forced
- set up crosspoints to be switched timed to 625 reference
- enable 625 SYNCS and wait until field pulse occurred or timeout
- disable SYNCS
- set up crosspoints to be switched timed to 525 reference
- enable 525 SYNCS and wait until field pulse occurred or timeout
- if timeout occurred then force SYNCS to take crosspoints
- set up crosspoints to be switched timed to TTL pulse
- enable TTL reference and wait until trigger pulse occurred

■ 5.3 Handshaking and error reporting

Freeway Card handshakes are obtained by utilising part of the crosspoint set mechanism. The order of events is as follows:-

1. Write Level and Destination
2. Read HSHAKE line

The HSHAKE line is common across all switcher modules but is only asserted from the module pertaining to the level and destination sent.

On power-up the 2440 control software will check if the auto-configure switch (sw2_6) is in the ON position (DOWN). If it is, the system reads all handshakes and then enables crosspoints for the modules that were detected. If in the OFF position (UP) the system uses the last module configuration as the template for enabling crosspoints. Thus, for parts of the router where no handshakes have been detected crosspoints will be inhibited.

It is important to power up the various router frames in the correct order to ensure a complete re-configure. The slave frames should be powered up first and then the master. If slave frames are powered up after the master then the master will fail to recognise theseframes.

The controller will periodically check the handshakes to ensure all modules are present and functional. If any handshake errors are detected then the card error LED 6 is lit to indicate this.

If cards are removed from a configured system, then all routes pertaining to that card will be continuously updated until the card is replaced and a handshake detected. The updating task will continue for a few seconds after the card is replaced to allow for full card insertion.

If extra cards are installed, the control card ignores them until the system is re-configured.

A user can invoke a re-configure by entering a command via the terminal interface (IM,level,C). This gives the option to re-configure all levels or just a single level. When handshakes are re-configured the system will automatically reset.

■ 5.4 Defining stereo analogue audio parameters

There are a number of programmable features associated with setting crosspoints on ***Freeway*** Stereo analogue audio routers. They are:

- left to both/right to both. This is a source oriented feature whereby one channel of a stereo source pair is routed to both channels at the output, hence left to both sees the left channel of a stereo source pair being routed to both left and right channels at the output. Right to both operates similarly
- mono or summation is a destination oriented feature whereby a stereo source pair is summed before being routed to a mono destination
- swap is a source or a destination oriented feature whereby the left and right channels of a stereo source pair are swapped over before being routed to the output
- a normal source or destination is one that requires no manipulation whilst being routed, i.e. no changing of channels

The following table defines all possible crosspoint scenarios. The 'Result' column shows the resultant crosspoint type set from a source and destination with the features programmed as shown.

KEY: BOTH - Left channel to both or Right channel to both

SWAP - Swap left and right channels

MONO - Sum left and right channels

NORM - Normal crosspoint

Source	Destination	Result
BOTH	MONO	BOTH
BOTH	SWAP	BOTH
BOTH	NORM	BOTH
SWAP	MONO	MONO
SWAP	SWAP	NORM
SWAP	NORM	SWAP
NORM	MONO	MONO
NORM	SWAP	SWAP
NORM	NORM	NORM

From this table some general rules about stereo audio switching can be obtained:

- a left to both or right to both source will override any destination feature.
- a normal source will be overridden by the output feature.
- a normal destination will be overridden by the source feature.
- a mono destination will override a normal or swapped source.
- a swapped source and a swapped destination will result in a normal crosspoint.

These features are stored on a source and destination basis in the database for each stereo analogue audio level configured. Each crosspoint is sent together with three extra audio bits to specify the appropriate feature.

More information is given in the second part of this manual.

■ 5.5 Using PC based editors

Two editors are available. A Windows based editor, detailed in chapter 9 and a text based editor which is the subject of a separate addendum to this manual.

Windows editor

Freeway systems shipped prior to the release of the Windows editor were supplied with a terminal based text editor. These systems can be easily upgraded to take advantage of the user friendly Windows GUI. Once a system has been upgraded to the Windows editor, the terminal editor will no longer function.

Because the Windows editor uses Pro-Bel General Switcher Protocol via the RS 232 port, the port cannot be set for use as a remote control port.

Systems already using Freeway with a control system should not need to upgrade the controller for use with this editor as the port functionality can be set via jumper links on the control card.

The Windows editor permits both on and off line changes to be made to the database.

In addition to the user guide supplied as part of this handbook, an HTML help file is also installed in the Freeway Editor directory once the editors have been installed.

■ 5.6 Configuring the database

Two databases are implemented - one editable and one not. The editable database only can be updated from the PC based editor. The non-editable database resides in FLASH EPROM and contains default data that cannot be edited.

On power up the editable database in NVRAM will be validated. This will comprise of a range check for each parameter and a database checksum test. If an error is detected then the whole database will be filled with default data.

Database contents

Both databases provide the following:

- 1 Matrix
- 8 Levels
- 129 sources per level
- 128 destinations per level
- 129 source names per level (8 char)
- 192 source associations
- 192 destination associations
- 192 destination association names (8 char)
- route inhibit table per level
- 32 Crosspoint Salvos
- 1000 crosspoint salvo records + free lists
- level type selection
- general remote port configuration
- 32 button per source keypads
- 32 button per dest keypads
- 8 off 8 char display, 9x4 destination dial-up keypad
- 8 off 8 char display, 9x4 source dial-up keypad
- 200 entry sequence nodes per keypad (key presses)
- 32 panel positions
- 32 panel names (8 char)
- controllable destinations per panel per multi-drop port
- controllable levels and brightness per panel per multi-drop port
- 16 source overrides per panel per multi-drop port
- audio configuration per source per level
- audio configuration per destination per level
- trigger method per source per level

Database mode

The controller uses the editable database when sw2_7 is in CONFIGURE mode and uses the default database when sw2_7 is in FIXED mode.

When sw2_7 is in the CONFIGURE position, changes made to the configuration of the system via the editor port will be saved in the editable database. The controller will use the editable database to effect changes to the router set-up.

When sw2_7 is in the FIXED position, changes to the configuration via the editor port will be saved in the editable database. The default database will be used to effect changes to the router set-up.

Database transfer

A database transfer is only invoked by a 'DT' command from the Editor port. Note that this command is only available with the terminal editor. Database transfer will only occur from active to idle card.

A database transfer includes a transfer of:

- the editable database
- tally table data for the number of destinations and levels configured
- protect data table
- router parameters
- installed modules in the configured system

WARNING: Do not press the reset button on the active card whilst transferring databases. The database update takes several minutes, and if the reset is pressed during this time ALL DATABASE SETTINGS WILL BE LOST, and the default database loaded.

Commands from the editor are only processed by the active controller. The idle controller ignores all commands. A database transfer must be initiated to make active and idle configurations identical.

Messages on Editor screen will indicate database transfer progress.

To swap the active/idle status between two controllers press the RESET button on the active card. The idle card now becomes the active card and vice versa.

Default settings

When sw2_7 is in the FIXED position the fixed EPROM based database containing a default configuration is used instead of the editable one. The default settings for the various parameters are defined in the tables on the following pages.

Default database configuration

Item	Default Configuration Details (sw2_7 = FIXED)		
		General	Panels
General Remote port 1 and General Remote port 2 (RS485)	Protocol Baud Rate Data Bits Parity Stop bits Handshake	SW-P-02 38.4K 8 EVEN 1 OFF	SW-P-06 38.4K 8 EVEN 1 OFF
General Remote port 3(RS232)	Protocol Baud Rate Data Bits Parity Stop bits Handshake	SW-P-08 38.4K 8 EVEN 1 OFF	
Level Types	8 levels, all ***Freeway*** Normal levels		
8 Character Source Names	'SRC 1' - 'SRC 64'		
8 Character Dest Asc. Names	'DEST 1' - 'DEST 64'		
Route Inhibits	None		
Salvos	None		
Source Associations	01 to 64 = 1 to 1, 65 to 192 = none		
Destination Associations	01 to 64 = 1 to 1, 65 to 192 = none		
Controllable Destinations	All dests controllable for every panel position		
Trigger Method per source	All set to 625 if sw2_5 up, 525 if sw2_5 down		
Source Audio Parameters	All set to normal crosspoint selection		
Destination Audio parameters	All set to normal crosspoint selection		

Default panel configuration for General Remote port 1

Panel Port 1						
Panel No.	**Panel Name**	**Device**	**Dests**	**Source**	**Overrides**	**Levels/ Brightness**
1	PNL 1-1	6276-x	All	All	None	All/6
2	PNL 1-2	6276-x	All	All	None	All/6
3	PNL 1-3	6276-x	ALL	All	None	All/6
4	PNL 1-4	6277-8	1-8, 33-40	All	None	All/6
5	PNL 1-5	6277-8	9-16, 41-48	All	None	All/6
6	PNL 1-6	6277-8	17-24, 49-56	All	None	All/6
7	PNL 1-7	6277-8	25-32, 57-64	All	None	All/6
8	PNL 1-8	6285	1	1-32	1 to 8	All
9	PNL 1-9	6285	1	33-64	1 to 8	All
10	PNL 1-10	6285	2	1-32	1 to 8	All
11	PNL 1-11	6285	2	33-64	1 to 8	All
12	PNL 1-12	6285	3	1-32	1 to 8	All
13	PNL 1-13	6285	3	33-64	1 to 8	All
14	PNL 1-14	6285	4	1-32	1 to 8	All
15	PNL 1-15	6285	4	33-64	1 to 8	All
16	PNL 1-16	6285	1-32	1-32	None	All

Default panel configuration for General Remote port 2

Panel Port 2						
Panel No.	**Panel Name**	**Device**	**Dests**	**Source**	**Overrides**	**Levels/ Brightness**
1	PNL 2-1	6276-x	All	All	None	All/6
2	PNL 2-2	6276-x	All	All	None	All/6
3	PNL 2-3	6276-x	ALL	All	None	All/6
4	PNL 2-4	6277-8	1-8, 33-40	All	None	All/6
5	PNL 2-5	6277-8	9-16, 41-48	All	None	All/6
6	PNL 2-6	6277-8	17-24, 49-56	All	None	All/6
7	PNL 2-7	6277-8	25-32, 57-64	All	None	All/6
8	PNL 2-8	6285	5	1-32	1 to 8	All
9	PNL 2-9	6285	5	33-64	1 to 8	All
10	PNL 2-10	6285	6	1-32	1 to 8	All
11	PNL 2-11	6285	6	33-64	1 to 8	All
12	PNL 2-12	6285	7	1-32	1 to 8	All
13	PNL 2-13	6285	7	33-64	1 to 8	All
14	PNL 2-14	6285	8	1-32	1 to 8	All
15	PNL 2-15	6285	8	33-64	1 to 8	All
16	PNL 2-16	Master 6276-x	All	All	None	All/6

Default dial-up keypad layout for 6276 panel

Protect						7	8	9
Line-up						4	5	6
	UP					1	2	3
	DOWN					DEST SRC	0	CLEAR

Default dial-up keypad layout for 6277 panel

Protect				7	8	9
Line-up				4	5	6
Alt dest	UP			1	2	3
Dest ident	DOWN			DEST SRC	0	CLEAR

■ 5.7 Understanding the database

The editable database, which is held in non-volatile RAM in the ***Freeway*** control card, determines the operation of the unit and its associated panels.

To understand its use, a number of terms have to be defined :

- level - this term describes a type of router e.g. video or audio level.
- source - this term is used to describe an input of a router.
- destination - this term is used to describe an output of a router.

To configure a system the following parameters within the database must be considered :

- level type
- source and destination associations
- source names and destination association names
- route inhibit tables per level
- keypad and panel configuration
- general remote port configuration
- trigger method selection per source per level
- audio features per source per level

Level types

The level type within the Freeway database define the router type, permitting advanced features such as audio parameters and video trigger method to be used. It also defines the shape of a router level where used as adual, triple or quad split for dual channel, YUV or RGBS operation.

Source and destination associations

This is a method of setting a group of associated sources on different levels to a group of associated destinations from a single button on a control panel. This is fundamental to the operation of the database.

For example, a destination association defines the destinations on each level that feed into a device, say a record VTR. Similarly, a source association defines the sources that originate from a device, say a playback VTR. An association is assigned a unique number referred to as an index.

An example of this is:

	Level Number							
Destination association index	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	1	1	1	1	1	1	1	3

Destination index 1 defines a set of destinations, one for each level, that comprises - levels 1 - 7 as dest 1 and level 8 as dest 3.

	Level Number							
Source association index	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
3	4	4	3	3	3	3	1	1

Source index 3 defines a set of sources, one for each level, that comprises - levels 1 and 2 as source 4, levels 3 - 6 as source 3 and levels 7 and 8 as source 1.

Source and destination associations have different properties due to the distributive nature of the router i.e. one source may feed to many destinations but a destination may only have one source routed to it. One user may route the same source as another without affecting each other. However, routing a source to the same destination as another user obviously does affect each other. Therefore, a source association index may contain the same source number on a given level as another index but a destination association index should contain unique physical destination numbers. This avoids operational confusion as the system does not check or prevent this condition.

A user may require one button to set the sources across all the levels and another button to set only the audio sources. In order to do this special associations are used.

For example :

	Level Number							
Destination association index	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
65	-	1	1	1	-	-	-	-

The level type assigned to level 1 is a ***Freeway*** router that has 64 sources and 64 destinations. Special Associations therefore start from source index 65, and can be used to assign extra source combinations not defined in the standard association table, including those which have no source associated with level 1. In the example above, source index 65 is used to select source 1 from levels 2, 3 and 4 only. Special associations always start one index number greater than the size of the fully equipped level 1 router for sources and destinations.

Note: The normal associations i.e. 1-64 must contain source numbers for level 1, corresponding to the association index numbers.

Source names

The Freeway database allows the entry of 8 character alphanumeric names for each source on each level, some panel types display these names when sources are preset and as sources routed to a destination on selected levels.

Destination association names

Some control panels control more than one destination and have 8 character alphanumeric displays to show the controllable destination. However, for space and operational reasons there is only one display so that each destination association index can be assigned a name and NOT each destination per level.

Route inhibit

This is a method of preventing sources from being set to certain destinations.

Salvos

Salvos are groups of crosspoints that are set altogether from a preselect and take operation on a control panel. A salvo is preselected and routed in a similar manner as

normal crosspoints. Depending on the type of panel a slightly different operation is required. See 'Panel types' for salvo operation for a particular panel.

Configuring source keypad

A keypad is a collection of buttons arranged on a panel. The database contains a number of logical keypads that may be assigned to a physical keypad on a panel. Two types of source keypads are available - button per source and dial-up keypads.

Button per source keypads operate in a single push to select a source association whilst the dial up keypad allows a sequence of up to four button presses to select a source association.

For example, the 6276 X-Y panel may have a dial up source keypad as follows:-

MON	QC	VTR	CAM	STUDO	TEST 7	BLACK 8	BARS 9
MAINT		KEY	EDIT		 4	PBOX 5	HARRY 6
TX		PGM	PST		 1	 2	 3
		DAT	SIL	TONE	DEST SRCE	0	CLEAR

Pressing <VTR> followed by <1> may select source VT1. Pressing <1> again may select VT11. In this way, multiple button sequences can be used to select different sources.

Configuring a source keypad involves assigning a source association to a button or a sequence of button presses.

Configuring destination keypad

Like the source keypads there are destination per button and dial up keypads. Configuring a destination keypad involves assigning a destination association to a button with a sequence of button presses.

Assigning panel types and keypads

This is a method of assigning different panel types and keypads to the sixteen panels on each of the two ports.

Assigning source overrides

Some panels have override inputs which when pulled low replace the current source to a destination with another source. On releasing the override the original source is restored.

Assigning controllable destination association indices

This is a method of setting which destination association indices can be controlled by a given panel or a given port that uses a common keypad.

Assigning controllable levels/brightness

This is a method of setting the levels controllable from a given panel on a given port. In addition, the brightness of the alphanumeric displays on some panels may also be adjusted.

Configuring port characteristics

This is a method of setting the protocols and transmission characteristics of the RS485 General Remote ports and RS232 Remote Control port.

Trigger method selection

This is a method to independently configure any source on any level to switch timed to one of four triggers: 525 NTSC, 625 PAL, TTL pulse or forced to crash switch.

Audio features

This is a method to independently configure any audio source on any level to switch in one of the following ways:

- channel swap
- left to both
- right to both
- summation

6 Panel details

This section details all functional and operational aspects of the panels supported by ***Freeway***.

■ 6.1 Summary of panel types

For control purposes, different panels with similar functions are grouped together. These groups are called “panel types” (although there may be minor differences in the functions available on the panels, e.g numbers of buttons). The table below shows which Pro-Bel panel model numbers relate to which panel type.

Throughout this chapter, where panel types are referred to, the commands are applicable to all models shown.

The table below lists all the panel types supported by the multi-drop panel ports of ***Freeway***.

Panel Type	**Description**	Model Number
1	Generic button per crosspoint BPX	6280, 6282, 6284, 6285, 6286
2	Generic X-Y (lamps)	6281, 6283, 6287, 6289
3	6276 X-Y	6276
4	Generic Multi-Output	6276 (2 bus), 6277
5	Dual 8 character UMD	
6	16 character UMD	

6.2 General panel details

The ***Freeway*** router can drive up to sixteen multi-dropped panels from each of the two RS485 General Remote ports.

Each panel on the same RS485 port must be set, according to its handbook, to have a unique multi-drop address. For this port and address, the database should be configured with the:

- panel type
- source keypad
- destination keypad
- controllable destination association indices
- controllable levels and brightness
- override sources
- panel name

6.3 Panel features

This section describes the various features encountered throughout the range of panel types.

Protect

The protect function prevents other control devices connected to ***Freeway***, including devices attached to the remote ports, from setting crosspoints on a particular destination. Until such a time as it is unprotected by the control device that protected the destination originally, or from the panel designated as master.

Protect operates on the destination assigned to each level for the destination association that was protected.

If a control device attached to the multi-drop device ports attempts to set crosspoints on a protected destination then an error message will be displayed on control devices with displays. See 'Panels with displays' section for display messages.

Setting a protected destination causes protect button LEDS on other BPX type panels to flash - if they are assigned to the same destination.

Line-up

This is a continuous toggle of preset and program sources allowing easier alignment of sources on a matrix level. Line-up of sources is selected as follows:

1 Route source to be aligned to desired destination.

2 Make sure the level of the sources to be aligned is the most significant active level.

3 Select reference source as the preset source.

4 Press <LINE-UP> button on panel. The LED associated with the <LINE-UP> button will light to show the <LINE-UP> button has been pressed.

5 Press <TAKE> button of desired destination. The source routed will toggle between the reference source and the source to be aligned.

Line-up of sources on a destination is cancelled by pressing the <LINE-UP> button again. This cancels line-up altogether on the control device.

The source being aligned is returned as the source routed to the destination being used and also the LED associated with the <LINE-UP> button will be extinguished.

Pressing another <TAKE> button on the same panel will cause the original source to be routed to the previous destination and then start the line-up sequence on the new destination.

N.B. All control devices will power-up with line-up *inactive*.

Decrement and increment

Each time the <DECREMENT> or <INCREMENT> button is pressed, the source or destination association number selected, depending on the active keypad, is decremented/incremented with the displays being updated accordingly. When decrementing/incrementing source associations, only levels that are active are changed with the most significant active level's source association as the association to change.

Alt-dest

Each time the <ALT-DEST> button is pressed, the panel changes control to the other set of assigned destination associations. When the LED to the left of the <ALT-DEST> button is illuminated, the panel is then controlling the second set of destination associations assigned to the panel. This function is typically used with multi-output panels.

Dest-ident

The <DEST-IDENT> button is used to identify the destination associations assigned to the <TAKE> buttons. Pressing and holding down the <DEST-IDENT> button changes the 'STATUS' displays to show the 8 character name for the assigned destination association for the current set of destination associations.

By pressing the <ALT-DEST> button, the other set of destinations can be identified by pressing and holding the <DEST-IDENT> button again. This function is typically used with multi-output panels.

Level buttons and controllable levels

A 'married' source refers to situations where, having selected or routed a source on one level, a user would automatically expect other levels to be married to it (i.e. associated with it). Level buttons allow the user to 'breakaway' selections from this marriage.

Each button operates in a toggle on/off manner with the level active indicated by an illuminated button. Unless otherwise stated each button toggles the state of one level only. Only levels that are controllable can be toggled on or off.

On occasions when more controllable levels are assigned to a panel than there are level buttons then the last level button controls the excess levels, i.e. if the controllable levels for a 4 level button panel were defined as 1, 2, 3, 4, 5, 6 then level 1 to 3 would be assigned to first three level buttons respectively, and the fourth level button would control levels 4, 5 and 6.

Single levels or all levels can be turned off, if required, via the editor terminal.

Alt-lev

The level shift function is used on panels with only four level buttons to allow individual control of all eight levels. It operates in a toggle on/off manner with an LED used to indicate the level shift - when the LED is off then levels 1 to 4 are controllable and when the LED is on levels 5 to 8 are controllable.

The level shift function is button programmable on all panel types (BPX and X-Y) in the same way as the protect feature. Any source or destination button can be configured as a level shift button and more than one source or destination button can be configured as a level shift button.

Clear

This key is used as a source preselect or destination clear key and is generally assigned to the bottom right key on the keypad.

Controllable destinations

This applies to X-Y panels only. The user can configure any destination association to be controllable from a given X-Y type panel.

Destination buttons

Button per destination type keypads and dial up keypads (multiple button presses) are available.

Pressing a destination button or a sequence of destination buttons selects a destination association index which references one destination per level. This gives the user the opportunity to make selections on different destinations.

The pressed button will either illuminate if it has a valid associated destination association index, or have alphanumeric displays to show the name of the selected destination association.

On power-up no destination button is selected so all destination buttons are extinguished and any destination displays on X-Y panels are blanked.

Source buttons

Button per source type keypads and dial up keypads are available.

Pressing a source button or a sequence of these buttons, routes sources on the active and controllable levels only.

The source buttons on some panels are used to preselect sources not route them. These panels have <TAKE> buttons to make the selections.

Panel swap mode

Panel Swap Mode is a panel assignable feature which swaps pre-select and source routed on <TAKE>, otherwise the pre-select does not change.

Display AUD parameters

This is an assignable feature to the special function buttons on 6276 X-Y and 6277 multi-bus panels only. When enabled this feature displays source and destination AUD parameters in the eighth character of the displays for the most significant stereo Analogue Audio level in the system.

Configure AUD parameters

This is an assignable feature to the special function buttons on 6276 X-Y and 6277 multi-bus only. When enabled this feature allows pre-selection of destination AUD parameters for stereo analogue audio levels. If panel is a Master 6276 X-Y then enabling this feature allows AUD parameters to be assigned to sources and destinations and allows trigger type to be assigned to sources. Enabling this feature automatically enables the 'display AUD parameters' feature.

Override inputs

Some panels allow a number of override inputs to momentarily override the current source routed to a destination with another source.

When all overrides are released the original source that was routed before any overrides were activated is restored. Override Inputs are activated by shorting the override input pin to 0V signal.

Each override input can have any source assigned to it and can be assigned to operate on any level.

If more than one override input is active on a panel, then the lowest number override will take priority.

When a destination is overridden no other crosspoint can be set on that destination by any means unless it is a higher priority override.

The maximum number of overrides available to any panel is 16.

Keyswitch input

6276 and 6277 panels have the software ability to accept a keyswitch input to inhibit the <TAKE> and source keypads. The default condition is <TAKE> button enabled (keyswitch on). If the keyswitch is disabled then the source 'PRESET' display indicates ' LOCKED '.

To disable the <TAKE> button and source keypad pin 1 of the AUX input on the rear of the panel needs to be connected to 0V.

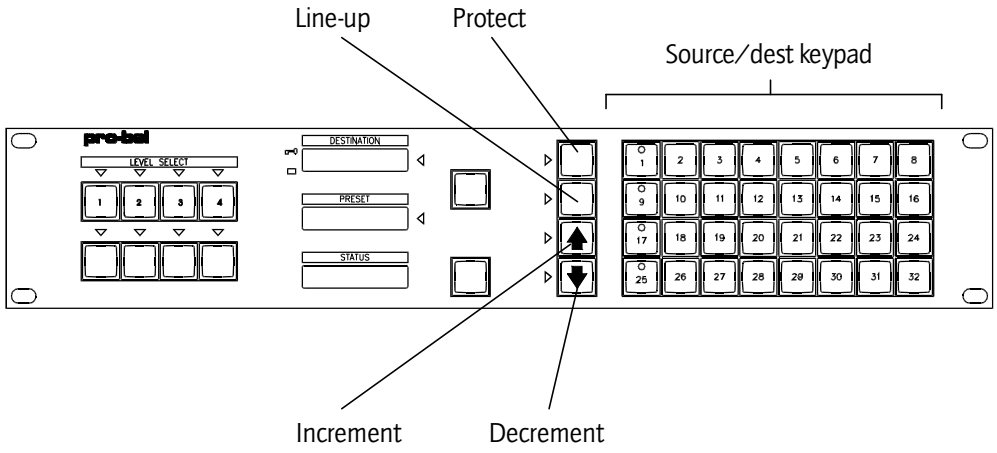
Making selections

'Crosspoint' selections (or routes) are made provided :

- the destination and source are valid for the level
- the destination is controllable
- the level is active and controllable
- the route is not inhibited
- destination is not protected
- an override is not active on this destination unless the source is a higher priority override
- the router is recognised as present by the ***Freeway*** control card.

Special Function Keys

6276 and 6277 type panels have 4 special function keys arranged in a vertical line of 4 buttons to the left of the source/dest keypad. These keys can each be assigned a different function as illustrated in the example below. See individual panel types for special functions supported.



Keypads

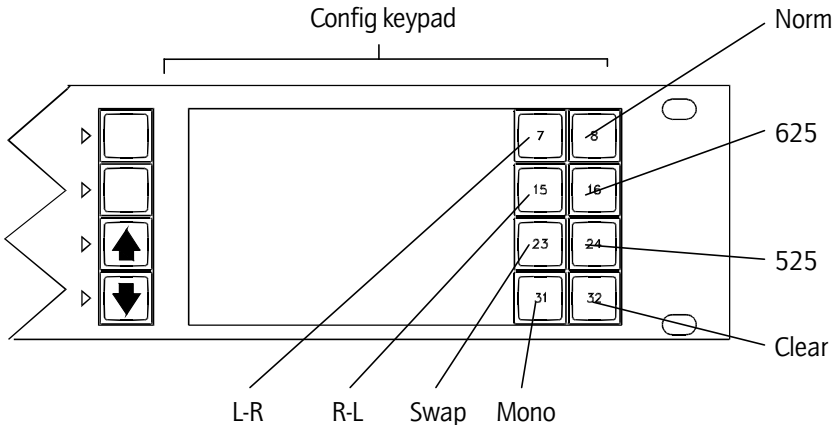
There are 32 assignable button per source keypads each with 64 source buttons (this allows each panel to have a different keypad) and 8 dial-up type source keypads for use on 8 character display panels.

There are 32 assignable button per destination keypads each with 36 destination buttons (this allows each panel to have a different keypad) and 8 dial-up type destination keypads for use on 8 character display panels.

The dial-up keypads allow a maximum of four button presses per source or destination selection.

Dial-up keypads can be used on display panels that need to access more sources or destinations than there are direct entry keys on the keypad. They can be assigned to the panel instead of the default button per source/destination keypad.

There is also an AUD config keypad used to assign AUD parameters on a button per parameter basis. It is used with 6276 and 6277 panels and is illustrated below. This keypad will only be active if <CONFIG AUD> assigned to one of the special function keys.



Panels with displays

These panels have alphanumeric displays for 8 character messages. The table below defines warning messages used throughout the range.

Valid source selections are shown on 'PRESET' or 'STATUS' displays as defined by the user. These will be shown as:

- 'SSSSSSSS' for 8 character.
- 'PRESET' warning messages are enclosed by ?....?
- 'STATUS' warning messages are enclosed by <....>

Message	Explanation
'<No Dst>'	No destination association selected
'<No Src>'	No source selected because no destination assigned for any level in destination association
'<↓↓↓↓>'	No destination assigned in the selected destination association on the most significant active level but there are destinations on the lower levels
'<↑↑↑↑>'	No destination assigned in the selected destination association on the most significant active level but there are destinations on the upper levels
'<↑↑↓↓>'	No destination assigned in the selected destination association on the most significant active level but there are destinations on the upper and lower levels
'?No Src?'	Source association with no sources on any level has been selected
'*LOCKED*'	Panel <TAKE> button and source buttons are disabled via keyswitch input
'**PROT**'	Source cannot be routed as destination is protected. After a few seconds the panel name is displayed before reverting back to showing the current source routed a few seconds later
'PROTECT?'	When flashing indicates that destination will be protected on next take

'*OVRIDE*'	Source cannot be routed as destination has overridden source routed. After a few seconds the name of the device responsible for the overrride is displayed before reverting back to showing the current source routed or preset a few seconds later.
'ROUTE INH'	Source cannot be routed as route inhibited. Displayed in Preset display
'?↓↓↓↓?'	No source preselected on the most significant active level but there are sources preselected on the lower levels
'?↑↑↑↑?'	No source preselected on the most significant active level but there are sources preselected on the upper levels
'?↑↑↓↓?'	No source preselected on the most significant active level but there are sources preselected on the higher and lower levels
'SALVO'	Displayed in STATUS or IN-USE displays to indicate that a salvo has been preselected.
'NO XPT!'	Error message displayed in STATUS or IN-USE to indicate that a crosspoint cannot be set as card not present.
'LEV CON'	Error message displayed in STATUS or IN-USE to indicate that a crosspoint was not made on a level because the level was not controllable from that panel.
'DST CON'	Error message displayed in STATUS or IN-USE to indicate that a crosspoint was not made because the X-Y panel attempting to set it is not allowed to control the destination.

The brightness of the displays on applicable panels may be changed by reconfiguring the database. It is not possible to have different brightness levels for different displays on the same panel.

The following table defines the AUD parameter symbols used on UMDS and panels with 8 character displays when the 'display AUD parameters' feature is enabled on a level.

Symbol	Description
space	Indicates normal source or destination
steady 'S'	Indicates destination is Swapped
steady 'M'	Indicates destination is Mono
flash 'N' and '?'	Normal destination pre-selected
flash 'S' and '?'	Swapped destination pre-selected
flash 'M' and '?'	Mono destination pre-selected
flashing 'L'	Left channel of source routed to both channels
flashing 'R'	Right channel of source routed to both channels
flashing 'S'	Left and right channels swapped
NRM or NRM?	Source is Normal or pre-selected to be Normal
L-R or L-R?	Source is L-R or pre-selected to be L-R
R-L or R-L?	Source is R-L or pre-selected to be R-L.
SWP or SWP?	Source L/R swapped or pre-selected to be L/R swapped
525 or 525?	Source using 525 trigger or pre-selected to use 525
625 or 625?	Source using 625 trigger or pre-selected to use 625
steady '→'	No audio parameters on current most significant active level but other levels configured with audio parameters.
flashing '→' with '?'	No audio parameters pre-selected on most significant active level but other levels configured with audio parameter pre-selected.
TRG?	No source pre-select on level thus unknown trigger.
AUP?	No source pre-select on level thus unknown audio parameter.

■ 6.4 Panel types

A description of all the panel types supported by ***Freeway*** are given in this section.

Generic BPX panels

Panels include 6280 (24BPS), 6284 (32 BPS) and 6286 (16 BPS), 6282 (24 BPS + 4 level breakaway) and 6285 (32 BPS + 4 level breakaway).

This panel type encompasses all BPX panels that conform to or are within the following constraints:

- 64 BPS keypad
- 8 destinations
- 8 level breakaway buttons
- 15 overrides + keyswitch input or
- 16 overrides (no keyswitch input)

The keypad buttons can be assigned as <SOURCE>, <SALVO>, <PROTECT> or <ALT-LEV> via the editor port.

This panel has two keypads associated with it - a source and destination keypad which are assigned via the editor port.

Only BPS and BPD keypads (1 - 32) can be assigned to these panels. A single button press is all that is required to set a crosspoint. No dial-up keypads are supported.

Source associations are assigned on a per button basis while destination associations are assigned to groups of 8 buttons, thus, for a 64 button BPX panel a maximum of 64 source associations and 8 destination associations can be assigned.

The destination associations for each group of 8 buttons are assigned to button positions 1 - 8 of the assigned BPD keypad.

The same source association can be assigned to more than one button. The same destination association can be assigned to more than a single group of 8 buttons.

Only one <SOURCE> button lamp per destination association assigned will be lit.

The levels controllable can be assigned via the Editors.

The <level breakaway> buttons operate on a toggle on, toggle off basis where the tally indicated on the panel is dictated by the number of level buttons on the panel.

For panels with no level buttons the tally indication for each destination association is for the first controllable level with an assigned destination for the assigned destination association. The source routed on that level is first compared against the source on the same level of the source association assigned to the last <SOURCE>

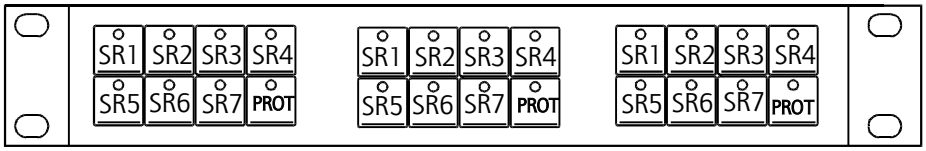
button pressed. If a match is found then this buttons lamp is lit, otherwise, the other buttons are checked in the same way until a match is found. The first match results in that <SOURCE> button lamp being lit.

For panels with level buttons the tally indication is for the current most significant active, controllable level (level 1 being the most significant level). Active levels are indicated by the level button LED being illuminated. Only controllable levels can be active (It is not possible to turn all level buttons off unless no levels are controllable).

If the current source association routed is assigned to more than one <SOURCE> button then the tally indicated will be for either the last <SOURCE> button pressed or the first button that source association is assigned to.

To have full 8 level breakaway control from only 4 physical level buttons a <ALT-LEV> button is required. This function can be assigned to any button on the panel by assigning the 'level shift association' to a button position on the source keypad. More than one button can be assigned as a <level shift> button.

Any <PROTECT> button assigned will only operate on the corresponding destination association. Thus, if the panel is set up to control more than one destination association and each destination association must be able to be protected from this panel then a button needs to be sacrificed to be a <PROTECT> for each destination association as illustrated below.



To protect a destination association simply select the desired source association and then press the <PROTECT> button. The protect lamp will light if at least one controllable level in the destination association is protected. When the protect lamp is lit further crosspoint selections on this destination association can be made but crosspoints will only take on the unprotected levels.

To unprotect a destination association select the <PROTECT> button again.

A protect lamp ON indicates that at least one controllable level in the destination association is protected from this panel.

A protect lamp ON for a period of 5 seconds, after a take, indicates that at least one active controllable level in the selected destination association is protected.

A protect lamp OFF indicates no controllable levels in the destination association are protected from this panel.

A protect lamp FLASHing indicates a level in the destination association is protected from another panel.

Protects can only be removed by:

- the original panel that set them
- a Master X-Y panel

In multi-output configured BPX panels the overrides only work on the destination assigned to the first group of eight buttons.

If more than one button is assigned as a protect for a single destination then only the first <PROTECT> found will have its lamp updated.

A protected destination cannot be overridden.

An overridden destination cannot be protected.

Salvos are not destination association oriented. Selecting a <SALVO> button causes all routes set up in that salvo to be made if they are not inhibited or protected.

Salvo takes ignore status of any <PROTECT> buttons on the panel.

The lamp in the <SALVO> button lamp is either lit for 5 seconds (indicates no error in salvo take) or flashes for 5 seconds (indicates error in salvo take) before returning to the correct tally. This 5 second period can be overridden if a <SOURCE>, <SALVO>, or <PROTECT> button is pressed in this time. In each instance the <SALVO> button lamp is extinguished and the correct tally indication is re-instated.

Selecting the same salvo from another panel does not cause an update of this panel's <SALVO> button lamp.

16 assignable overrides and no keyswitch input or 15 assignable overrides plus keyswitch input are supported. Overrides can operate on any source on any level.

If line-up is initiated from another panel then tally indications will be updated accordingly.

Generic X-Y (lamps)

These panels include 6281 (24x12x4), 6283 (8x8), 6287 (16x16) and 6289 (8x8x4).

This panel type has a source and destination keypad associated with a different group of buttons on the panel. This panel type encompasses all lamp driven X-Y panels that conform to within the following constraints:

- 64 BPS keypad
- 32 BPD keypad
- 8 level breakaway buttons

- keyswitch input
- no overrides

The buttons associated with the keypads can be assigned as <SOURCE>, <SALVO>, <PROTECT> or <ALT-LEV> via the editor port.

64x32 with fully married control and no breakaway is the largest X-Y panel possible.

The source and destination keypads are assigned via the editor port.

Only BPS and BPD keypads (1 - 32) can be assigned to these panels. No dial-up keypads are supported.

The same source association can be assigned to more than one button. The same destination association can be assigned to more than one button.

Only one <SOURCE> button lamp will be lit and only one <DESTINATION> button lamp will be lit.

The levels controllable can be assigned via the Editors.

The <level breakaway> buttons operate on a toggle on, toggle off basis where the tally indicated on the panel is dictated by the number of level buttons on the panel.

For panels with no level buttons the tally indication for each destination association is for the first controllable level with an assigned destination for the assigned destination association. The source routed on that level is first compared against the source on the same level of the source association assigned to the last <SOURCE> button pressed. If a match is found then this buttons lamp is lit, otherwise, the other buttons are checked in the same way until a match is found. The first match results in that <SOURCE> button lamp being lit.

For panels with level buttons the tally indication is for the current most significant active, controllable level (level 1 being the most significant level). Active levels are indicated by the level button LED being illuminated. Only controllable levels can be active (It is not possible to turn all level buttons off unless no levels are controllable).

If the current source association routed is assigned to more than one <SOURCE> button then the tally indicated will be for either the last <SOURCE> button pressed or the first button that source association is assigned to.

To have full 8 level breakaway control from only 4 physical level buttons a <ALT-LEV> button is required. This function can be assigned to any button on the panel by assigning the 'level shift association' to a button position on the source keypad. More than one button can be assigned as <ALT-LEV>.

<PROTECT> buttons will only operate on the current active and controllable destinations. To protect/unprotect a destination simply press the <PROTECT>

button. The <PROTECT> button lamp will indicate the status of the most significant active controllable level of the selected destination association.

To unprotect a destination: select the desired <DEST> button (<PROTECT> button lamp lit if any level of the selected destination association is protected from this panel); activate required levels; press <PROTECT> button. The destinations are now unprotected. If all destinations have been unprotected by this action then the <PROTECT> button lamp will be extinguished.

The <PROTECT> button lamp indication will be for the most significant active controllable level for the destination association selected.

A protect lamp ON indicates that the most significant active controllable level in the selected destination association is protected from this panel.

A protect lamp ON for a period of 5 seconds, after a take, indicates that at least one active controllable level in the selected destination association is protected.

A protect lamp OFF indicates that the most significant active controllable level in the selected destination association is unprotected.

A protect lamp FLASHing indicates that the most significant active controllable level in the selected destination association is protected from another panel.

Protects can only be removed by:

- the original panel that set them (see description above)
- a Master X-Y panel

Buttons on either source or destination keypads can be assigned as <PROTECT>.

If more than one button is assigned as a protect then only the first <PROTECT> found will have its lamp updated.

The levels controllable can be assigned via the Editors.

Salvos are not destination association oriented. Selecting a <SALVO> button causes all routes set up in that salvo to be made if they are not inhibited or protected.

Salvo takes ignore status of any <PROTECT> buttons on the panel.

The <SALVO> button lamp is either lit for 5 seconds (indicates no error in salvo take) or flashes for 5 seconds (indicates error in salvo take) before returning to the correct tally. This 5 second period can be overridden if a <SOURCE>, <SALVO>, or <PROTECT> button is pressed in this time. In each instance the <SALVO> button lamp is extinguished and the correct tally indication is restored.

Selecting the same salvo from another panel does not cause an update of this panel's <SALVO> button lamp.

If more than one button is assigned as <ALT-LEV> then all these buttons will have there lamps updated together.

Panel lock via a keyswitch input is not supported on these panels.

If line-up is initiated from another panel then tally indications will be updated accordingly.

These types of panels have a source and destination keypad associated with a different group of buttons on the panel. Any source association can be assigned to a <SOURCE> button on the assigned button per source keypad and any destination association can be assigned to a <DESTINATION> button on the assigned button per destination keypad.

A destination association is selected by pressing the required <destination> button. The destination button will illuminate along with the source button corresponding to the source routed for the destination on the most significant level. If the current source routed is assigned to more than one source button then the tally indicated will be either the tally for the last source button pressed or the first button that source is assigned to.

Crosspoints are set by pressing the appropriate <SOURCE> buttons - the current tally indicated by an illuminated source button LED.

Crosspoints are only set on the controllable, active levels.

The 'PROTECT' feature can be assigned to any button on the panel by assigning the 'protect association' to a button position on the button per source keypad or the button per destination keypad. More than one button can be assigned as a <PROTECT> button.

There are no override inputs associated with this type of panel.

6276 X-Y

This type of panel provides X-Y control of all source and destination associations with breakaway on all eight controllable levels. Tally indications use 8 character names. This panel also has a keyswitch input to disable the <TAKE> button.

This panel type uses the main 9x4 keypad for pre-selecting source and destination associations. The source and destination keypads are overlaid on top of each other. Any source or destination association button selection sequence can be assigned to any of the 36 source or destination buttons.

Either the button per source/destination keypads or the 8 character display dial-up keypads can be assigned to this type of panel. If the button per source or destination keypads are assigned then only 35 of the available source or destination associations can be assigned.(One is reserved for Clear)

The levels that can be controlled are assignable on this panel type.

The level buttons toggle on and off and operate in the same manner as other panel types.

Crosspoint selection is detailed in the steps listed below:

1 Toggle <S/D SELECT> button until LED to the right of the 'DESTINATION' display illuminates

2 Press the required destination buttons to select a destination association.

3 Activate/De-activate required levels

4 Toggle <S/D SELECT> button until the LED to the right of the 'PRESET' display illuminates

5 Press the required source buttons to select a source association.

6 Repeat steps 3-5 until the required sources are preselected

7 Activate all levels on which crosspoints are to be set

8 Press the <TAKE> button

Salvos can only be dialled up from the source keypad. Part entry and single keypress sequences can be used. Salvo selection is detailed in the steps listed below:

1 Toggle <S/D SELECT> button until the LED to the right of the 'PRESET' display illuminates. The source keypad is now active.

2 Press the required source buttons to select a salvo

3 Press the <TAKE> button

A salvo take will override any restrictions in a panels list of controllable destinations.

Route inhibits are obeyed.

Salvo takes do not override protected routes.

<LINE-UP>, <PROTECT>, <INCREMENT>, <DECREMENT>, <CONFIG-AUD> and <DISPLAY-AUD> can be assigned to the four special function buttons on this panel type.

<PROTECT>, <INCREMENT> and <DECREMENT> can also be assigned to the keypad buttons.

<CLEAR> is dedicated to the bottom right button of the keypad.

The 'STATUS' display shows the source routed for the most significant active level.

<PROTECT> does not require an LED button. Setting a destination protected is described below:

1 Dial-up a destination

2 Press <PROTECT>. 'PROTECT?' will flash in PRESET display to indicate destination will be protected on a TAKE

3 Press <TAKE>. The destination is protected. PRESET display reverts to showing what was displayed previously.

The protect lamp (situated to the left of the DESTINATION display) indications are described below:

A protect lamp ON indicates that the most significant active controllable level in the selected destination association is protected from this panel.

A protect lamp ON for a period of 5 seconds, after a take, indicates that at least one active controllable level in the selected destination association is protected.

A protect lamp OFF indicates that the most significant active controllable level in the selected destination association is unprotected.

A protect lamp FLASHing indicates that the most significant active controllable level in the selected destination association is protected from another panel.

These panels can be defined, via editors, to work in Panel swap mode. When the take button is pressed the previously routed sources are exchanged with the pre-selected source association. The Preset display will be updated to show the previously routed sources (on active levels only).

On stereo analogue audio levels, with the audio parameter feature enabled, the source name is limited to the first 7 characters on 'PRESET' and 'STATUS' displays. The eighth character gives an indication of the audio parameter configured for the source as defined in the table. in the 'Panels with displays' section. This is also applicable to the 'DESTINATION' display where the eighth character gives an indication of the audio parameter configured for the destination displayed in the first 7 characters.

On left hand side of the 'DESTINATION' display is an amber LED which when ON indicates that the sources routed to the destination association selected are an 'UNMARRIED' combination.

These panels can be designated Master and can be used to configure AUD parameters for sources and destinations. See 'Configuration via panels' section for details.

There are no override inputs associated with this type of panel.

Generic multi-output

Generic multi output panels include 6276 (2-bus) and 6277 multi-bus variants.

This type of panel provides control of all source associations on a maximum of 16 destination associations (but only a maximum of 8 destination displays on one panel) with breakaway on all eight controllable levels using 8 character names. This panel also has a keyswitch input to disable the <TAKE> and source buttons.

This panel type uses an 9x4 (6276) or 7x4 (6277) keypad for preselecting source associations. Either a button per source keypad or the 8 character display dial-up source keypads can be assigned to this type of panel. If the button per source keypads are assigned then only 35 (9x4 keypad) or 27 (7x4 keypad) of the available source associations can be assigned (<CLEAR> uses a button on keypad). If a source dial-up keypad is used then any source association button selection sequence can be assigned to any of the 31 source buttons.

Any destination association can be assigned to the <TAKE> buttons and are configured using the button per destination keypad buttons, 1-16.

The levels that can be controlled are assignable on this panel type.

The level buttons toggle on and off and operate in the same manner as other panel types.

Crosspoint selection is detailed in the steps listed below:

1 Activate/De-activate required levels.

2 Select required source association.

3 Repeat steps 1 and 2 until required sources are preselected.

4 Activate all levels on which crosspoints are to be set.

5 Press the <ALT-DEST> button to set the required destination association assigned to one of the <TAKE> buttons. To check that the required destination association is assigned to a <TAKE> button use the <DEST-IDENT> button.

6 Press the required <TAKE> button.

Salvos can only be dialled up from the source keypad. Part entry and single keypress sequences can be used. Salvo selection is detailed in the steps listed below:

1 Press the required source buttons to select a salvo

2 Press any <TAKE> button

A salvo will override any restrictions in a panels list of controllable destinations.

Route inhibits are obeyed.

Salvo takes do not override protected routes.

These panels can be defined, via the editors, to work in Panel swap mode. When a take button is pressed the previously routed sources are exchanged with the pre-selected source association. The Preset display will be updated to show the previously routed sources (on active levels only).

Any four of the following functions; <LINE-UP>, <ALT-DEST>, <DEST-IDENT>, <PROTECT>, <INCREMENT>, <DECREMENT>, <CONFIG-AUD> and <DISPLAY-AUD> can be assigned to the four special function buttons on this panel type.

<PROTECT>, <INCREMENT> and <DECREMENT> can also be assigned to the keypad buttons.

<CLEAR> is dedicated to the bottom right button of the keypad.

<PROTECT> does not require an LED button. Setting a destination protected is described below:

1 Press <PROTECT>. 'PROTECT?' will flash in PRESET display to indicate destination will be protected on a TAKE.

2 Press <TAKE>. The destination is protected. PRESET display reverts to showing what was displayed previously.

The protect lamp (situated to the left of the DESTINATION display) indications are described below:

A protect lamp ON indicates that the most significant active controllable level in the selected destination association is protected from this panel.

A protect lamp ON for a period of 5 seconds, after a take, indicates that at least one active controllable level in the selected destination association is protected.

A protect lamp OFF indicates that the most significant active controllable level in the selected destination association is unprotected.

A protect lamp FLASHing indicates that the most significant active controllable level in the selected destination association is protected from another panel.

If a valid destination association is configured, the 'STATUS' display shows the source routed for the most significant active level and the 'DESTINATION' display shows the destination association name for the assigned destination association.

For 6276 (2-bus) panels the LED to the right of the source preselect display will always be illuminated and the LED to the right of the destination association display will always be off.

On left hand side of the 'DESTINATION' display is an amber LED which when ON indicates that the sources routed to the destination association are an 'UNMARRIED' combination.

Preset/Program swap is optional and is assigned via the editor.

Destination AUD parameters can be configured from this panel. See section on configuration via panels for details.

16 assignable overrides, or 15 assignable overrides plus keyswitch input are supported. Overrides can operate on any source on any level.

Dual 8 character destination follow UMD

This panel type actually assigns a dual 8 character destination follow UMD to a panel position on a chain. The UMD will only be capable of destination follow. The dual 8 character UMD can be used to follow either a single destination or two destinations.

When being used to follow a single destination the last eight characters of the UMD are used to display the source routed. The display message is still 16 characters long but the first 8 characters are spaces.

When used in dual mode, the first 8 characters (LHS of display) are used to display the source routed to the first destination assigned and the second 8 characters (RHS of display) are used to display the second destination assigned.

If only one destination association is assigned to the UMD then the UMD assumes single destination follow.

The source name displayed is for the source routed to the destination of the first level assigned in the destination association.

When 'display AUD parameters' is enabled for the UMD then the eighth character of the display is used to indicate the combined source and destination audio parameter for the most significant active Analogue Audio level configured. The source name is limited to the first 7 characters. See 'Panels with displays' section for definition of symbols used.

16 character destination follow UMD

This panel type actually assigns a 16 character destination follow UMD to a panel position on a chain. The UMD will only be capable of single destination follow.

These UMDS use the middle 8 characters (characters 5 to 12) to display the source name.

The source name displayed is for the source routed to the destination of the first level assigned in the destination association.

When 'display AUD parameters' is enabled for the UMD then the 12th character of the display is used to indicate the combined source and destination audio parameter for the first assigned level in the destination association. The source name is displayed in the first 8 characters. See 'Panels with displays' section for definition of symbols used.

■ 6.5 Configuration via panels

This section details the operation of: the Normal 6276 X-Y; Generic Multi-Output and 6276 X-Y Master panels with regards to: assignment of audio parameters for Analogue Audio sources and destinations; assignment of trigger type to sources.

The four special function buttons are assignable, however two new special function buttons are required:-

- <DISPLAY AUDIO> enable/disable display of AUD parameter indication.
- <CONFIG AUDIO> enable/disable configuration of AUD parameters

Common rules

While 'config AUD parameters' is enabled then only AUD parameters can be pre-selected (i.e. sources and destinations cannot be dialled up). Pressing <CLEAR>, while in this mode, will result in the panel returning to it's previous state.

If the 'display audio parameters' function is disabled then full 8 character names will be displayed with no AUD parameter, even if the first level is ***Freeway*** Analogue Audio.

Selecting 'display audio' function results in the 8th character of the displays showing the AUD parameter assigned for the most significant active level.

Assuming 'display audio parameters' is enabled then:-

The 8th character in PRESET and STATUS displays is:-

- steady (non-flashing) when source AUD parameter is NORMAL
- flashing when source AUD parameter is NOT NORMAL, i.e. SWAP

8th character in PRESET window shows AUD parameter of the pre-selected source displayed for the most significant active level in the system.

8th character in STATUS displays shows AUD parameter of combined source and destination taken for the most significant active level.

8th character in DESTINATION displays shows the destination AUD parameter of the destination displayed for the most significant active level in the system.

If <CONFIG AUDIO> pressed to enable configuration of AUD parameters and no buttons are pressed within a 1 minute timeout period then this function is automatically disabled and the panel is returned to its previous state.

Enabling configuration of audio parameters always results in 'display audio parameters' being enabled.

The 'N' character to denote Normal is only used in AUD parameter pre-selecting. Usually 8th character is left blank to denote Normal.

If pre-selected route is found to be inhibited (from either editable route inhibit table or internal system inhibit table) then the destination AUD parameter pre-selected will be thrown away.

If a route is protected then AUD parameters and trigger type cannot be changed.

Normal 6276 X-Y

Rules

Only Destination AUD parameters can be assigned from this panel type.

8th character in DESTINATION display is also used to show the pre-selected destination AUD parameter when character alternating with '?'.

Enabling configuration of AUD parameters by pressing <CONFIG AUDIO> will always result in selector LED being lit against DESTINATION display.

Operation 1

Press <DISPLAY AUDIO> to enable audio parameters to be displayed (optional).

Select DESTINATION display.

Dial up destination (e.g. VT 3)

Press <CONFIG AUDIO> (selector LED lit against DESTINATION display) followed bythe required AUD parameter. The pre-selected AUD parameter is displayed (flashing alternately with '?') in the 8th character of the DESTINATION display.

Press <TAKE> to:-

- assign AUD parameter to destination
- update 8th character of DESTINATION display to indicate new AUD parameter

- update 8th character of STATUS display with combined source and destination AUD parameter.
- auto cancel 'config AUD parameters' mode

Operation 2

Press <DISPLAY AUDIO> to enable audio parameters to be displayed (optional).

Select DESTINATION display.

Dial up destination (e.g. VT 3)

Select PRESET display

Dial up a source (e.g. VT 7)

Press <CONFIG AUDIO> (selector LED lit against DESTINATION display) followed by an AUD parameter. The pre-selected AUD parameter is displayed (flashing alternately with '?') in the 8th character of the DESTINATION display.

Press <TAKE> to:-

- assign AUD parameter to destination
- update 8th character of DESTINATION display to indicate new AUD parameter
- update 8th character of STATUS display with combined source and destination AUD parameter
- auto cancel 'config AUD parameters' mode

Generic multi-output panels

Rules

Only Destination AUD parameters can be assigned from this panel type.

When DEST-IDENT activated the 8th character in STATUS displays shows AUD parameter of the destination for the most significant active level in the system.

8th character in PRESET display normally shows AUD parameter of the pre-selected source displayed for the most significant active level in the system. It is also used to show the pre-selected destination AUD parameter.

Operation 1

Press <DISPLAY AUDIO> to enable audio parameters to be displayed (optional).

Clear PRESET display.

Press <CONFIG AUDIO> and select an AUD parameter. An 8 character name is displayed in the PRESET display to indicate destination AUD parameter pre-selected.

Press <TAKE> to:-

- assign AUD parameter to destination
- update 8th character of STATUS display with combined source and destination AUD parameter
- auto cancel 'config AUD parameters' mode and blank PRESET display

Operation 2

Press <DISPLAY AUDIO> to enable audio parameters to be displayed (optional).

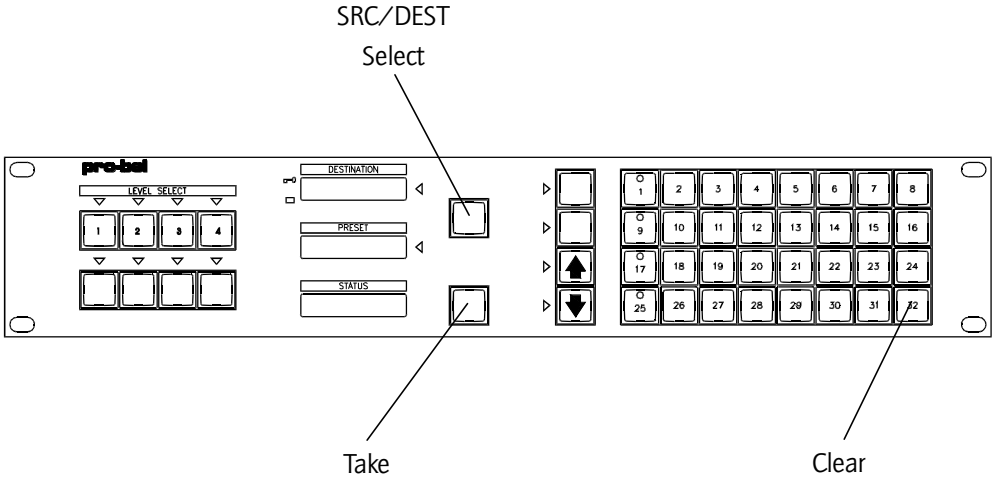
Dial up source in PRESET display.

Press <CONFIG AUDIO> and select an AUD parameter. The pre-selected AUD parameter is displayed (flashing alternately with '?') in the 8th character of the PRESET display.

Press <TAKE> to:-

- assign AUD parameter to destination
- update 8th character of STATUS display with combined source and destination AUD parameter
- revert to showing source AUD parameter in 8th character of PRESET display
- auto cancel 'config AUD parameters' mode

Master 6276 X-Y panel



The operation of this panel is identical to that of a Normal 6276 X-Y panel but has the option of being able to configure AUD parameters and trigger type for sources as well as being able to unprotect destinations set from another panel if <PROTECT> assigned.

To assign AUD parameters and trigger type to sources:-

Press <DISPLAY AUDIO> to enable audio parameters to be displayed.

Dial up source in PRESET display.

Press <CONFIG AUDIO> (DESTINATION display selector LED lights).

Press <S/D SELECT> to select PRESET display. N.B. There must be a source dialled up in PRESET display before source AUD parameters can be changed.

DESTINATION display blanks and STATUS display shows 4 character name for trigger type assigned and 4 character name for AUD parameter assigned to source.

Pre-select AUD parameter and/or trigger type. STATUS display shows 3 character ident for trigger type and AUD parameter followed by '?' (e.g. '625 SWP?' - trigger type to remain unchanged but SWAP pre-selected as AUD parameter).

Press <TAKE> to:-

- assign trigger type and AUD parameter to source
- display new parameters in STATUS display for 2 seconds before reverting back to displaying source routed in STATUS display and destination in DESTINATION display.
- auto cancel 'config audio parameters'

7 Level types

The term 'level type' is used to describe the type and size of router assigned to a particular level . The following sections describe the level types allowed:

■ 7.1 Normal Freeway

Normal ***Freeway*** encompasses Analogue Video, Digital Video, Stereo Analogue Audio, AES Audio and hetero-format Stereo Analogue Audio/AES Audio level types operating in stereo married switching mode in all router sizes from 16x16 to 64x64, and up to 128x128 for audio routers.

■ 7.2 YUV Freeway (5x5, 10x10, 15x15 or 20x20)

This level type takes a 16x16 or 32x32 or 48x48 or 64x64 video router and converts it to a 5x5 or 10x10 or 15x15 or 20x20 component video router.

Only source and destination numbers in the range 1-20 are valid for control purposes. NOTE: Destinations and Sources 16, 32, 48 and 64 are not used.

The physical sources and destinations are arranged as shown below:

Destinations

Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1-5,17-21 33-37,49-53	Y			Y			Y			Y			Y				Y			Y			Y			Y			Y			
6-10,22-26 39-44,54-58		U			U			U			U			U				U			U			U			U			U		
11-15,27-31 45-49,59-63			V			V			V			V			V				V			V			V			V			V	

Destinations

Sources	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
1-5,17-21 33-37,49-53	Y			Y			Y			Y			Y				Y			Y			Y			Y			Y			
6-10,22-26 39-44,54-58		U			U			U			U			U				U			U			U			U			U		
11-15,27-31 45-49,59-63			V			V			V			V			V				V			V			V			V			V	

■ 7.3 Dual channel FREEWAY (8x8 to 64x64)

This level type takes any configuration of audio router, from 16x16 to 128x128, and converts it into a married dual channel audio router with exactly half the number of both sources and destinations (16x16 becomes 8x8 etc). Similarly, two video routers of the same size, with the same level address may be used as a dual signal router, such as for YC or for Video and KEY routing.

Only sources and destination numbers in the range 1 - 64 for audio, and 1 - 32 for video, are valid for control purposes.

The first 64 physical sources and destinations are arranged as shown below:

Sources	Dests 1-8	Dests 9-16	Dests 17-24	Dests 25-32	Dests 33-40	Dests 41-48	Dests 49-56	Dests 57-64
1-8	Channel 1 S1-8 D1-8		Channel 1 S1-8 D9-16		Channel 1 S1-8 D17-24		Channel 1 S1-8 D25-32	
9-16		Channel 2 S1-8 D1-8		Channel 2 S1-8 D9-16		Channel 2 S1-8 D17-24		Channel 2 S1-8 D25-32
17-24	Channel 1 S9-16 D1-8		Channel 1 S9-16 D9-16		Channel 1 S9-16 D17-24		Channel 1 S9-16 D25-32	
25-32		Channel 2 S9-16 D1-8		Channel 2 S9-16 D9-16		Channel 2 S9-16 D17-24		Channel 2 S9-16 D25-32
33-40	Channel 1 S17-24 D1-8		Channel 1 S17-24 D9-16		Channel 1 S17-24 D17-24		Channel 1 S17-24 D25-32	
41-48		Channel 2 S17-24 D1-8		Channel 2 S17-24 D9-16		Channel 2 S17-24 D17-24		Channel 2 S17-24 D25-32
49-56	Channel 1 S25-32 D1-8		Channel 1 S25-32 D9-16		Channel 1 S25-32 D17-24		Channel 1 S25-32 D25-32	
57-64		Channel 2 S25-32 D1-8		Channel 2 S25-32 D9-16		Channel 2 S25-32 D17-24		Channel 2 S25-32 D25-32

7.4 Quad channel FREEWAY (4x4 to 32x32)

This level type takes any audio router configuration from 16x16 to 128x128 and converts it into a married quad channel audio router with a quarter of the number of sources and destinations (16x16 becomes 4x4 etc). Similarly any video router can be converted into a Y, U, V and KEY router.

Only source and destination numbers in the range 1-32 for audio, and 1 - 16 for video, are valid for control purposes.

The physical sources and destinations are arranged as for the Quad channel TM32 but extended to encompass all 64 sources and destinations.

7.5 Machine control FREEWAY (33x32, 49x48, 65x64, 129x128)

This level type is a RS422 Machine Control router. It always has an extra source for parking.

7.6 Normal TM32 and TM16

Normal TM32 level types operate in mono switching mode in router sizes of 16x16, 32x16 or 32x32.

7.7 YUV TM32 and TM16 (5x5, 10x5 or 10x10)

This level type takes a TM32 32x16, TM32 32x32 or TM16 16x16 video router and converts it to a 10x5 or 10x10 component video router.

Only source and destination numbers in the range 1-10 are valid for control purposes. NOTE: Destinations and sources 16 and 32 are not used.

The physical sources and destinations are arranged as shown below:

Destinations																															
Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
1-5,17-21	Y			Y			Y			Y			Y				Y			Y			Y			Y			Y			
6-10,22-26		U			U			U			U			U				U			U			U			U			U	
11-15,27-31			V			V			V			V			V				V			V			V			V			V

■ 7.8 Dual channel TM32 and TM16 (8x8 or 16x16)

This level type takes a 16x16 or 32x32 audio router and converts it into an 8x8 or 16x16 married dual channel audio router. Similarly, two 32x16 or 32x32 video routers with the same level address may be used as an 8x8 or 16x16 YC or Video and KEY router.

Only sources and destination numbers in the range 1 - 16 are valid for control purposes.

The physical sources and destinations are arranged as shown below:

Sources	**Dests 1-8**	**Dests 9-16**	**Dests 17-24**	**Dests 25-32**
1-8	Channel 1 S1-8 D1-8		Channel 1 S1-8 D9-16	
9-16		Channel 2 S1-8 D1-8		Channel 2 S1-8 D9-16
17-24	Channel 1 S9-16 D1-8		Channel 1 S9-16 D9-16	
25-32		Channel 2 S9-16 D1-8		Channel 2 S9-16 D9-16

7.9 Quad channel TM32 and TM16 (4x4 or 8x8)

This level type takes a 16x16 or 32x32 audio router and converts it into a 4x4 or 8x8 married quad channel audio router. Similarly a 32x16 or 32x32 video router can be converted into a 4x4 or 8x8 YUV and KEY router.

Only sources and destination numbers in the range 1-8 are valid for control purposes.

The physical sources and destinations are arranged as shown below:

Sources	Dests 1-4	Dests 5-8	Dests 9-12	Dests 13-16	Dests 17-20	Dests 21-24	Dests 25-28	Dests 29-32
1-4	Channel 1 S1-4 D1-4				Channel 1 S1-4 D5-8			
5-8		Channel 2 S1-4 D1-4				Channel 2 S1-4 D5-8		
9-12			Channel 3 S1-4 D1-4				Channel 3 S1-4 D5-8	
13-16				Channel 4 S1-4 D1-4				Channel 4 S1-4 D5-8
17-20	Channel 1 S5-8 D1-4				Channel 1 S5-8 D5-8			
21-24		Channel 2 S5-8 D1-4				Channel 2 S5-8 D5-8		
25-28			Channel 3 S5-8 D1-4				Channel 3 S5-8 D5-8	
29-32				Channel 4 S5-8 D1-4				Channel 4 S5-8 D5-8

■ 7.10 Normal TM24 (24x6 or 24x12 or 24x24)

Normal TM24 level types operate in mono switching mode in router sizes of 24x6, 24x12 or 24x24.

■ 7.11 Dual channel TM24 (12x6 or 12x12)

This level type takes a 24x12 or 24x24 audio router and converts it into a 12x6 or 12x12 dual channel audio router. Similarly, two 24x12 or 24x24 routers configured as this type with the same level address may be used as a 12x6 or 12x12 YC or Video and KEY router.
Only source and destination numbers in the range 1-12 are valid for control purposes. The physical sources and destinations are arranged as shown below :

Sources	**Dests 1-6**	**Dests 7-12**	**Dests 13-18**	**Dests 19-24**
1-12	Channel 1 dests 1-6		Channel 1 dests 7-12	
13-24		Channel 2 dests 1-6		Channel 2 dests 7-12

■ 7.12 YUV TM24 (8x2 or 8x8)

This level type takes a 24x6 or 24x24 video router and converts it into an 8x2 or 8x8 component video router.
Only source and destination numbers in the range 1-8 are valid for control purposes. The physical sources and destinations are arranged as YUV components as shown below :

	Destinations																							
Sources	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1-8	Y			Y			Y			Y			Y			Y			Y			Y		
9-16		U			U			U			U			U			U			U			U	
17-24			V			V			V			V			V			V			V			V

8 The Freeway Windows editor

■ 8.1 Hardware requirements

Freeway Editors have been designed to run on the Microsoft Windows 95, or NT4 operating systems.

The editor and associated programs require around 3.2 Mbytes of hard drive space. Each saved database typically requires 1.3 Mbytes.

To use the editor 'On-Line', the PC must have an RS 232 port capable of operating at 38.4 Kbaud.

■ 8.2 Installing the Editors

The Freeway editor is supplied either on a CD ROM, Product number FRE-EDIT-WN32, or as an e-mail attachment.

If you have previously used the terminal editor 'FRWCFG.EXE' to edit the system database, then it will also be necessary to upgrade the Flash EPROM using the batch files supplied with the Freeway Editor install program.

To install from CD;

Insert the CD ROM into the PC's CD drive and either;

Click 'Start', then select Run from the start menu, then type D:Setup and click OK, or

Run Explorer, view the contents of the CD ROM and select Setup.exe and follow the instructions on screen.

An HTML help file is provided with the editor package.

9 Problem solving

The following information is intended as a brief guide for diagnosing faults associated with any ***Freeway*** router.

The problem solving section of the user guide for the associated router type should also be consulted.

There is no power from the PSU?

- check mains is connected
- ensure that the fuse is intact (Note: both live and neutral are fused)

The green LED on the routing card is off?

There is no power on the card.

- check the PSUs
- ensure that the card is properly seated in the frame

There is no communication with PC on the RS232 port?

- check the power
- check that the ***Freeway*** control card is running- LED 4 flashes
- ensure that PC is connected to the 'CONFIGURE' port on the 'Master' router
- check cable interconnections
- ensure that the electrical parameters of the serial port are set up correctly
- check that the correct COM port is being used on the PC
- check that the control card switch settings are correct.

There is no communication with external controllers on RS485 ports?

- check power
- ensure ***Freeway*** control card is running - LED 4 flashes
- check cable interconnections
- check that the associated LED on the ***Freeway*** control card is flashing - indicating valid data received from the controller
- check electrical characteristics and protocol of controlling device are compatible with that configured into the ***Freeway*** database

There is no communication with panels on RS485 ports - panels in self-test?

- check power
- ensure ***Freeway*** control card is running - LED 4 flashes
- check that the 2440 ***Freeway*** control card is configured for peripheral mode operation
- check cable interconnections

Signals are not routing between cards?

- check that all ribbons between cards of similar type are connected on the front edge of the modules.
- ensure that ribbons have NOT been connected between cards of different signal types (i.e. Digital video, Analogue video, Audio).

The panel is communicating but no (or incorrect) responses to button presses - panels not in self-test?

- check cable interconnections
- ensure that each panel has a unique serial address
- check that the panel is configured for multi-drop operation

The panel controls the wrong destination?

- check that the panel is assigned correctly in database

The panel cannot select a crosspoint?

- check database for:
  - panel assignment
  - level active
  - route not inhibited
  - no override active
  - level controllable
- check level and sub-level switches

The panel selects crosspoint but signal routed is absent or low quality?

- check router cards are properly seated
- ensure ribbon cables on front edge of cards are plugged in correctly
- check cables are properly connected on rear panels
- ensure rear panels are properly installed

Cannot select crosspoint from external controllers?

- check database for:
  - route not inhibited
  - no override active
  - no protect set
- check level and sub-level switches
- check system has detected modules on level

LED 6 lit on 2440 *Freeway* control card?

There is a handshake error. From one or more cards in the system

10 Specification

Facilities

- modular router
- digital video, digital audio, analogue video and analogue audio router types
- single or dual PSU operation

Control

- 1 RS232 port for configuration and control
- 2 RS485 ports for driving two chains of 16 multidrop panels OR external control
- parallel port for control of other slave ***Freeway*** routers
- database editable from PC determining system operation
- option to use editable or fixed database

Performance

As stated in ***Freeway*** user guide for associated signal type.

Power

Supply	300W nominal
PSU (3U)	Maximum current @ -5V is 36A
	Maximum current @ +5V is 9A
	Fan assisted cooling

General

Frame size:	19’ rack mounting frame
Weight :	12Kg (3U)
(fully equipped)	24Kg (6U)

Temperature range

Operating:	0°C to +40°C
Storage:	-10°C to +70°C

11 Support Information

■ 11.1 Warranty information

Warranty statement

The warranty period covering Pro-Bel hardware is 2 years from the date of shipment. During the first two months of this period, any defective product will be exchanged free of charge.

For the remainder of this period any defective product returned carriage paid will be repaired or replaced free of charge within our normal turnaround period of 21 days. Where the defect is attributable to misuse or physical damage the warranty will be deemed void with all costs associated with the repair or replacement subject to charge.

Standard repair charges will apply to bought in items, power supplies, etc.

Repairs required in less than the normal 21 day period will incur additional charges.

The warranty period covering software products is 90 days. Beyond this support/maintenance contracts are available and depending on the equipment may be mandatory for a 3 year period.

WARNING: Ensure that any returned unit is adequately and appropriately packed; for example, do not pack static sensitive products in common

■ 11.2 Telephone support

If technical help or advice is required, then in the first instance, Customers are advised to contact their local sales office.

Customers with equipment directly supplied from Pro-Bel, are advised to contact Customer Support, which has been set up to provide hardware, systems and product support for all Pro-Bel supplied equipment.

To use this service please ensure you have the following information:

- order acknowledgement no.
- System product type no.
- Your order no.

Any of these numbers will help us to quickly identify the equipment referred to.

Product type numbers - 4 digits

System type numbers - 4 digits beginning with 7 or 8 found on top of rear panel of (custom equipment) frames or on system handbooks

- any module numbers relevant to the fault and their serial numbers (e.g. 03/0017/05)
- a clear description of the fault
- any relevant historical information
- any other information that might help diagnose the fault

■ 11.3 Contacting our support departments

UK office

Telephone number - 44 (0) 118 921-4214

Fax number - 44 (0) 118 921-4268

E-mail address - support@pro-bel.co.uk

The department is staffed from 8.00am to 7.00pm Monday to Friday (excluding UK public holidays)

Additional support is available outside these hours by purchasing a support contract - details available from the above number.

US office

Telephone number - 1-888-84PROBEL (USA toll free)

1-516-548-2132 (Latin and South America)

Fax number - 1-516-845-1267

E-mail address - support@chyron.com

Standard business hours are 9.00am to 7.00pm EST Monday to Friday

Additional support is available outside these hours by purchasing a support contract - details available from the above number.

■ 11.4 Equipment repairs

If the fault can be isolated to a single module, then the module can be sent for repair in the following way:

- please have the following information ready before telephoning your nearest Support/Service department.
- type of board/module number.
- batch number - this is on a small label and consists of 3 or 4 numbers preceeded by a letter.

UK repairs

- phone the helpdesk on +44 (0) 118 921-4214 and a helpdesk operator will ask for the above information and issue you with your unique repair number
- complete a returns label in full (especially the repair number) - if you do not have a supply of labels we can send you some
- remove the self advesive address label and attach it to your return envelope
- pack the module securely and post

US repairs

- phone the helpdesk on: 1-888-84PROBEL (US toll free)
  1-516-845-2132 or
  1-516-845-3888

You will be asked for the above information and issued with your unique repair number

Note: All repairs must be accompanied by a repair number.

■ 11.5 Equipment loans

If a loan module is required to cover a repair being sent:

- please contact Customer Support, who will arrange the loan
- a small charge is made to cover administration, so please have an order number ready
- the loan will be sent to you in the normal way (urgent deliveries will be charged at cost)
- when returning the loan please provide the following:

    the loan reference number, supplied with the loan

    a contact name and telephone number

    a list of modules being returned with their serial numbers

For correct address to send your loan returns to, see ‘Sending equipment to Pro-Bel’

It is very important that you advise us if you need to keep the loan beyond the 'return by' date.

■ 11.6 Equipment exchanges

Exchanges are normally issued if a module has gone faulty within the first two months of delivery.

When returning your faulty module, which has been exchanged, please supply the following information:

- the exchange reference number
- a contact name and telephone number
- a description of the fault symptoms
- a list of modules supplied with their serial numbers

For correct address to send your exchange returns to, see ‘Sending equipment to Pro-Bel’

■ 11.7 Sending equipment to Pro-Bel

The following addresses should be used when sending repairs, loan returns and exchange returns to Pro-Bel.

UK customers

Customer Support
Pro-Bel Limited
Danehill
Lower Earley
Berkshire RG6 4PB
England

Telephone: +44 (0)118 921-4214

US customers

Customer Support
Pro-Bel America
5 Hub Drive
Melville
NY 11747

Telephone: 1-516-845-2132

Other customers

All other customers should contact their local agent, or UK Customer Support for their correct return address.

12 Important safeguards

12.1 Checking the equipment

If this equipment is being used for the first time, is being installed in a new location or has not been used for a long time then the following checks should be carried out.

Check that the equipment is not mechanically damaged; if it is the unit should be checked by a qualified engineer and, if necessary, returned to Pro-Bel Limited or to its agent.

12.2 Safety guidelines

All Pro-Bel equipment meets the requirements of specifications:

- European/British Standard EN60950 - 'Safety of Information Technology Equipment including Electrical Business Equipment'
- American National Standard UL1419 - Standard for Safety for Professional Video and Audio Equipment'

Note: When installing rack mounted equipment, ensure that all external metal work is earthed.

High temperatures

Under normal circumstances certain internal components, such as heat sinks and mains transformers, may be too hot to touch; also, if a fault develops one or more components may become unusually hot. However no part that can be touched in normal use should ever exceed 65°C; nevertheless **always take care.**

Disposal

None of the active devices or other components in this unit contains any hazardous or dangerous chemicals or substances and therefore there are no special precautions that need to be observed if this equipment is disposed of.

Connection to a.c. Power

Depending on the location in which this unit is installed, it may require different types of power cords. A suitable cord, complying to local regulations, should be used. The cord must be rated to carry the current shown on the equipment rating.

High voltages

To prevent electrical shock when working on this equipment disconnect both a.c. line cords from the a.c. source before working on any internal components.

ESD warning

***WARNING*: All of the modules fitted contain static sensitive components and full anti-static precautions should be taken when handling them.**

Warnings

- heed all warnings on the unit and in the technical manual
- do not use this product in or near water
- disconnect both a.c. power before installing any options
- route power cords and cables so that they are not easily damaged
- disconnect power before cleaning
- do not use liquid or aerosol cleaners
- dangerous voltages exist at several points in this product - to avoid personal injury, do not touch exposed connections and components while the power is on
- do not wear hand jewellery or watches when troubleshooting high current circuits, such as the power supply
- to prevent damage to equipment when replacing fuses, locate and correct the trouble that caused the fuse to blow before applying power
- to avoid fire hazard, replace fuses only with the specified type, voltage and current rating - always refer fuse replacement to qualified service personnel
- to avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation
- during installation, do not use the door handles or front panels to lift the equipment because they may open abruptly and injure you
- have qualified personnel perform safety checks after any completed service

■ 12.3 Cautions

- use only specified replacement parts
- the front door of the cabinet is part of the fire enclosure and should be kept closed during normal operation.
- this product should be powered only as described in the user guide.

WARNING **:** The information in this manual is for use by qualified personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the manual unless you are qualified to do so. Refer all servicing to qualified service personnel.

13 EMC compliance information

General

Pro-Bel equipment has been tested against the European standards EN50081-1 and -2. In all cases, the results depended heavily on the use of the correct cables and connectors, and their correct assembly. Precautions applicable to each common signal type are specified below. Installation provisions must be followed in order that compliance is maintained in service. Normal practice as regards pushing cards fully home and ensuring that connectors are well seated is essential to good EMC performance.

Digital audio connections

Cable should be of good 110Ω design with a foil shield, such as Canford DST. This shield must make contact all round at the entry to the mating connector body. Pro-Bel equipment with AES3 interfaces is fitted with 'D' type connectors and the shield is grounded to the chassis at the point of entry. The 'D' type shield should be of the tinned type fitted with screw-locks and with dimples on the male part. Where a number of channels use the same connector, an overall shield is preferred in addition to individual shields and this must also be firmly grounded at both ends.

Serial digital video inputs and outputs

Cable should be good quality 75Ω design with double braided screens such as PSF1/3 or Belden 8281. Pro-Bel equipment with Digital Video ('SDI' or SMPTE 259M) interfaces are fitted with BNC type connectors where the shield is grounded to chassis at the point of entry. BNC plugs must be of the best quality as this type is prone to EMC leakage if contact is not good all round the shell.

It is possible to improve the emissions caused by this leakage by using cables with ferrite collars. This prevents leakage affecting adjacent cables in the installation space.

Analogue video

As with analogue audio the risk lies with processors within the same equipment. All output BNCs have the shield grounded at the fixing point and most inputs. However, some inputs have floating connectors for maintenance of common-mode rejection. Again, only good double-screened cable such as PSF1/3 should be used.

Analogue audio (including time-code)

This causes the least problem as the signal spectrum is benign and the circuit designs generally reject most unwanted signals. Some interference could occur if the equipment contains processors, etc; so all screens are grounded at the point of entry. Good quality cables with foil shields should be used with the shield carried through from end to end, and connected to the chassis earth at the point of entry using a very short tail.

Data and Control Signals

Cable should be of good quality with a foil shield. This shield must make contact all round at the entry to the mating connector body at both ends of the cable. Pro-Bel equipment with control interfaces is fitted with 'D' type connectors and the shield is grounded t othe chassis at the point of entry. The 'D' type shield should be of the tinned type fitted with screw-locks and with dimples on the male part. Ribbon cables are NOT suitable under any circumstances outside the equipment frames.

Other signal formats

MADI and binary high-bit-rate telecom signals should be treated as digital video.

Other telecom signals, eg HDB3 signals at 34Mbit/s, 8448 and 2048kbit/s are more akin to analogue video, but the presence of high frequency clock signals inside the frame is more likely. The installation of telecom equipment may require reference to telecom standards. These usually use unbalanced BNC connections, but occasionally balanced 120Ω circuits will be used, and should be treated as AES3.

Other balanced signals such as X21 (64,128,384,728 and 2048kbit/s) should be treated as RS422/V11 control ports, and generally use 'D' type connectors.

Mains

All Pro-Bel equipment has the mains earth connected to the chassis at the point of entry, which reduces EMC emissions.